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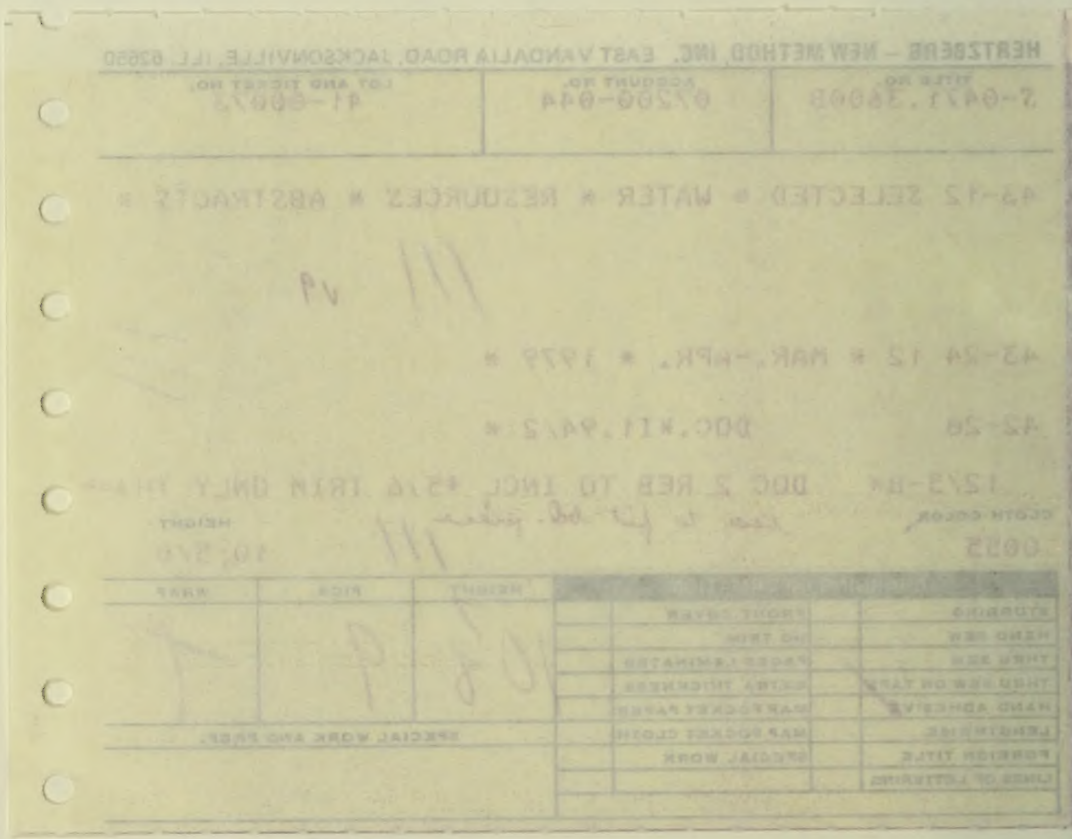

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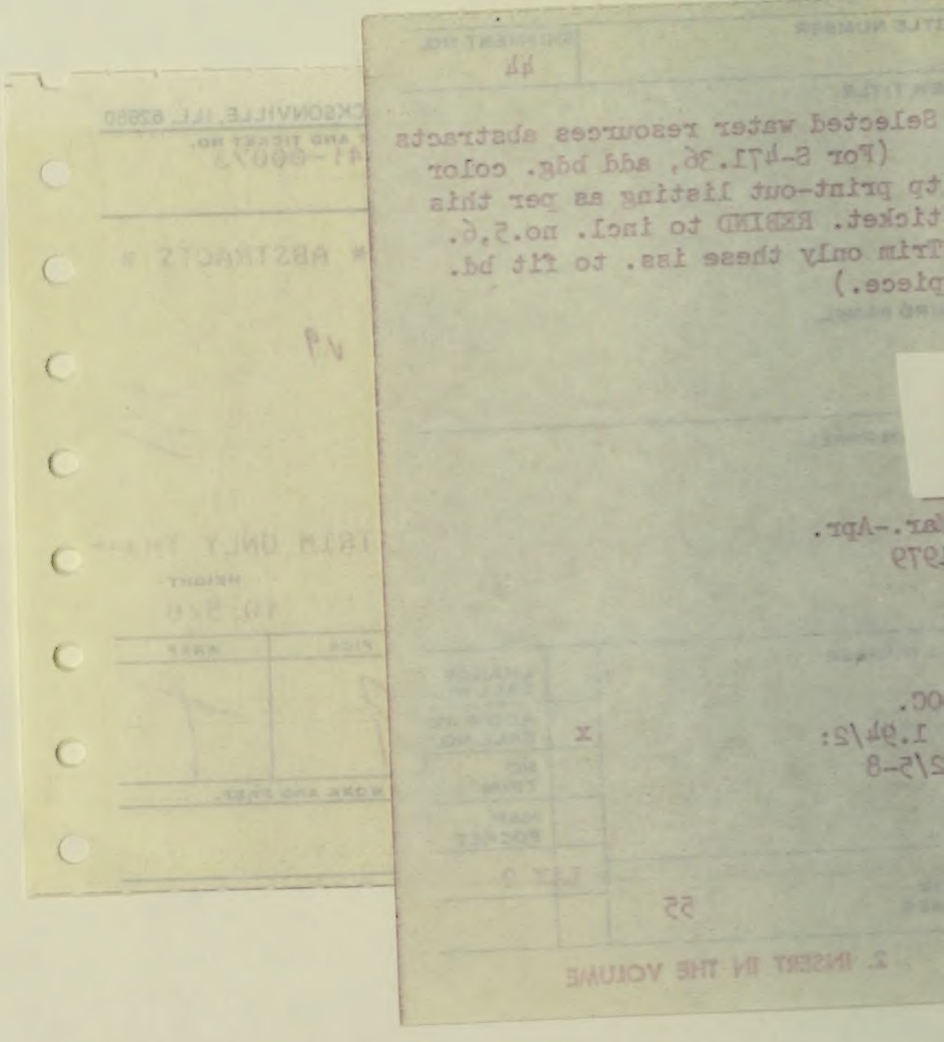

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 5
MARCH 1, 1979

W79-02001—W79-02500

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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06 WATER RESOURCES PLANNING
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

SUPERCOOLING OF WATER TO -92 DEGREES C UNDER PRESSURE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
For primary bibliographic entry see Field 2C.
W79-02494

1B. Aqueous Solutions and Suspensions

ION MOBILITIES IN PURE WATER VAPOUR AT SATURATION,
Missouri Univ.-St Louis. Dept. of Physics.
B. L. Henson.
Journal of Physics D. Applied Physics, Vol 11 p 1405-1411, 1978. 3 fig, 25 ref. OWRT A-047-MO(2), 14-31-0001-3525.

Descriptors: Conductivity, Trace ionic impurities, Electroanalysis, Time-of-flight techniques, *Ion transport, *Water vapor, *Electrochemistry, *Thermal dissociation.

Positive and negative charge carrier mobilities in pure water vapour have been measured under conditions of liquid-vapour equilibirum in the temperature range of 20-70C. Both signs of charge carriers have the same measured mobility and evidence is given for heavy ion clustering. These data are explained in terms of the Chapman-Enskog kinetic theory mobility equation and the clustering is shown to obey a thermal dissocation law.
W79-02076

2. WATER CYCLE

2A. General

COMPLEX RELATIONS BETWEEN THE HYDROLOGIC BUDGET OF THE MAJOR GEOGRAPHIC ZONES OF THE EARTH,
Akademiya Nauk SSSR, Moscow. Inst. Geografii.
A. V. Belyayev.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 30-37, 1977. 7 fig, 1 tab, 21 ref. Translated from News of the USSR Academy of Sciences, Geographic Series (Izvestiya Akad. nauk SSSR. Ser. geogr.), No. 1, p 38-50, 1977.

Descriptors: *Hydrologic budget, *Regions, *Hydrologic equation, *Mathematical models, Analytical techniques, Analysis, Hydrology, Evaporation, Precipitation(Atmospheric), Hydrologic cycle, Hydrologic aspects, Infiltration, Runoff, Runoff coefficient, Foreign research, Foreign countries, *USSR.

A system of zonal hydrologic relations was presented that combines zonal structural and interpolation relations according to a six-component system of hydrologic equations and on the principle of geographic zonality. Some properties of such relations were investigated, and analytic expressions for their descriptions were proposed. Values were tabulated of the relative characteristics of the hydrologic budget, including the coefficient of total wetting (W/P) and the runoff coefficient (R/P), taken from this complex zonal relations and corresponding to precipitation of 500 and 1000 mm. When the absolute amount of precipitation doubles (increases from 500 to 1000 mm), the total wetting coefficient decreases by an average of 7-14%, and the runoff coefficient increases by 23%, i.e., these relative characteristics do not vary very significantly with different amounts of precipitation within a single zone. Yet the change in the entire combination of physiographic conditions, besides precipitation, produces great changes in the structure of the hydrologic budget. For example, with a hypothetical precipitation of 1000 mm, more than twice as much water is spent on infiltration in savannas than in the tundra. The difference in the structure of total river runoff is also considerable. Whereas groundwater runoff accounts for only 8% of the total river runoff in the tundra, mainly because of permafrost which prevents the seepage of water to the water table, its proportion is 30% in the mixed forest zone of the temperate belt. (Humphreys-ISWS)
W79-02208

BROOK: A HYDROLOGIC SIMULATION MODEL FOR EASTERN FORESTS,
Forest Service (USDA), Durham, NH.
For primary bibliographic entry see Field 4D.
W79-02448

2B. Precipitation

DISASTER RESPONSE TO FLASH FLOOD,
Federal Water Pollution Control Administration, Denver, CO. South Platte River Basin Project.
For primary bibliographic entry see Field 8B.
W79-02193

DROUGHT IN THE UPPER MIDWEST, 1931-1969,
Iowa Univ., Iowa City. Dept. of Geography.
M. P. Klugman.
Journa of Applied Meteorology, Vol. 17, No. 10, p 1425-1431, October 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Droughts, *Precipitation(Atmospheric), *Central U.S., *Great Plains, *Climatology, Weather, Rainfall, Statistics, Statistical methods, Data collections, Analytical techniques, Data processing, Distribution patterns, Meteorology, Eigenvector analysis.

Monthly Palmer Drought Index values for the periods 1931-40, 1941-50, 1951-60, and 1961-69 were subjected to eigenvector analysis. Patterns and periods of variable moisture conditions resulted which fit the patterns found in drought studies of areas east and west of the upper Midwest. The 1930's and 1950's included years of severe drought, but the patterns of drought were not identical. The 1930's drought spread from the west; the 1950's drought spread from the south and southwest. The 1940's and 1960's were wetter than normal in the upper Midwest. (Sims-ISWS)
W79-02196

ANALYSIS OF ERROR IN THE DETERMINATION OF SNOW STORAGE FOR SMALL HIGH ARCTIC BASINS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W79-02197

FULL-SEASON RAIN GAUGE HAVING REPLACEABLE CHARTS FOR MAKING PROFILE GRAPHS,
For primary bibliographic entry see Field 7B.
W79-02304

REMOTE SENSING TECHNIQUES AND THE MONITORING OF DESERTIFICATION PROCESSES IN ARID AREAS,
Desert Inst. Ashkhabad (USSR).
For primary bibliographic entry see Field 7B.
W79-02390

2C. Snow, Ice, and Frost

ROOT PRODUCTION AND ROOT TURNOVER IN A WET TUNDRA ECOSYSTEM, BARROW, ALASKA,
Duke Univ., Durham, NC. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02100

TELEMETRIC DETERMINATION OF SALMONID WINTER MICRO-HABITAT OCCUPATION AND MOVEMENT IN ICE-COVERED STREAMS,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 7B.
W79-02157

ANALYSIS OF ERROR IN THE DETERMINATION OF SNOW STORAGE FOR SMALL HIGH ARCTIC BASINS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
M. K. Woo, and P. Marsh.
Journal of Applied Meteorology, Vol. 17, No. 10, p 1537-1541, October 1978. 4 fig, 1 tab, 10 ref.

Descriptors: *Water balance, *Snowpacks, *Snow surveys, *Storage, *Arctic, *Canada, Snowmelt, Melt water, Runoff, Water resources, Snow, Snowfall, Watersheds(Basins), Tundra, Terrain analysis, Regression analysis, Data processing, Meteorology, *Snow storage.

Water balance studies in tundra regions require accurate snowfall data, but weather station records often underestimate basin snow storage. However, snow storage can be determined by snow surveys conducted prior to the melt period because Arctic snowpacks do not melt during winter. Topography strongly controls snow distribution. A basin can be subdivided into various terrain types, and the snow survey then establishes the snow characteristics of each terrain type so that basin snow storage is obtained as the areally weighted mean. Such a survey was carried out in small basins near Resolute, Northwest Territories, traversing different types of terrain. The results confirmed that weather station snowfall grossly understimated basin snow storage. Since it is also desirable to simplify future snow surveys by reducing the number of transects, an error analysis was performed to determine the error resulting from a grouping of terrain types. It was found that both maximum and mean error increased as the number of terrain types was reduced, but the increase was not substantial when certain terrain types were combined. A mean error of 15% is expected when only four types of terrain (hilltops, flats, gullies, valleys, and slopes) are recognized in the survey, but the error quickly increases when further simplification of the terrain is introduced. (Sims-ISWS)
W79-02197

COMPUTATION OF SOIL FREEZING DEPTH IN THE ZONE OF AERATION,
G. P. Zhmayeva.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 17-20, 1977. 2 fig, 8 ref. Translated from Transactions of the Hydrometeorological Scientific Research Center of the USSR (Trudy GMTs), No. 183, p 48-55, 1977.

Descriptors: *Zone of aeration, *Freezing, *Soils, *Mathematical models, Thawing, Unsaturated flow, Analytical techniques, Soil moisture, Depth, Mathematical studies, Equations, Foreign research, Foreign countries, Soil temperature, *USSR.

In some regions of the USSR, spring runoff losses are affected not only by soil moisture but also largely by the depth of soil freezing. Unfortunately, available network observations of freezing depth are insufficient in many cases to account for its effect because of observation shortages and also because of the large variations in freezing conditions over a drainage basin. A method was proposed for computing soil freezing depth on the basis of methods of mathematical physics. This method was designed for the use of standard observations at the station network of the Hydrometeorologic Service. Use of the proposed model of soil freezing (thawing) makes it possible to obtain the following additional information on this process: (1) the dynamics of the freezing front; (2) the vertical soil temperature distribution in the frozen and thawed zones; and (3) the variation of the soil moisture curve in the thawed zone. The proposed model was verified in the Kostroma River basin from standard observations over the period from 1955 to 1973. The computed and measured freezing depths were close. (Humphreys-ISWS)

W79-02215

PHYSICAL PROPERTIES OF ICEBERGS, PART I--HEIGHT TO DRAFT RATIOS OF ICEBERGS, PART II--MASS ESTIMATION OF ARCTIC ICEBERGS,
Coast Guard Research and Development Center, Groton, CT.
R. Q. Robe, and L. D. Farmer.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 240, Price codes: A05 in paper copy, A01 in microfiche. Report CG-D-102-76, June 1976. 25 p, 8 fig, 5 tab, 9 ref.

Descriptors: *Icebergs, *Mass, *Height, *Shape, Surveys, Remote sensing, Ice, Sea ice, Photography, Aircraft, Aerial photography, Data processing, Sonar, Height to draft ratios, Iceberg mass.

A study of height-to-draft ratios of icebergs near the Davis Strait revealed ratios which range from 1:1.28 to 1:10.56. The ratios of bergs dominated by their horizontal dimension, such as tabular or broken tabular icebergs, have average height-to-draft ratios of 1:4.46 and 1:4.26, respectively. Bergs with a more vertical nature, pinnacle or drydock bergs, have ratios averaging 1:2.31 and 1:2.41, respectively. The smallest ratios are found in domed bergs, which average 1:6.30. If it is assumed that the height-to-draft ratio of icebergs is characterized by a continuous distribution and then a Kruskal-Wallis one-way analysis of variance technique is used, the hypothesis that the average ratio of icebergs is not significantly different for gross visual shape classes can be tested. The result was that for the sample icebergs there is no significant difference. For summary purposes, the average of the averages (1:3.95) can be used as descriptive of the height draft ratio of icebergs regardless of visual shape class. Between the berg heights of 10 m and 60 m, which is the range of this sample, the height was related to the height-to-draft ratio by a power curve. Analysis of stereo pairs of 22 icebergs, in the region of Davis Straits, revealed that a reasonable estimate of total iceberg mass, in metric tons, can be arrived at by multiplying the gross dimensions of the iceberg (height x width x length) in meters together, and then multipying this produce by a factor of 3.01. This factor accounts for the density difference between seawater and freshwater ice; it also accounts for the average shape and mass distribuion of icebergs. (Sims-ISWS)
W79-02216

CONSTRUCTION AND OPERATION OF LOW-PRESSURE DAMS ON PERMAFROST SOILS,
For primary bibliographic entry see Field 8D.
W79-02220

SUPERCOOLING OF WATER TO -92 DEGREES C UNDER PRESSURE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
H. Kanno, R. J. Speedy, and C. A. Angell.
Science Vol. 189, p 880-881, September 1975. 1 fig, 17 ref. OWRT B-051-IND(8).

Descriptors: *Supercooling, *Differential thermal analysis, Crystallization, Freezing, Nucleation.

The temperature at which 'clean' supercooled water freezes has been determined as a function of pressure up to 3 kilobars, using a differential thermal analysis technique on subdivided water samples. The supercooling limit of such samples, -38 degrees C at normal pressure, is lowered by initial increase of pressure, reaching a minimum value of -92 degrees C at 2.00 kilobars.
W79-02494

2D. Evaporation and Transpiration

THE MICRO-CLIMATE OF NARROW- AND WIDE-ROW SORGHUM WITH EQUAL PLANT DENSITIES,
Kansas State Univ., Manhattan. Evapotranspiration Lab.
J. J. Owonubi, E. T. Kanemasu, and W. L. Powers.
Agricultural Meteorology, Vol 15, p 61-69, 1975. 5 fig, 3 tab, 11 ref. OWRT A-056-KAN(2), 14-31-0001-3816.

Descriptors: *Evapotranspiration, Advection, *Sorghum, Microclimates, *Net radiation, *Sensible heat, Stomatal resistance, Leaf water potential.

Net radiation, evapotranspiration (lysimetric), soil heat flux, temperature, vapor pressure, and wind speed were measured within and above narrow- and wide-row sorghum with equal plant density. Total energy balance for 9 clear days showed no significant difference in net radiation (Rn) above the narrow and wide rows. Evapotranspiration (LE) accounted for an average of 88% and 89% of Rn in the narrow and wide rows, respectively. LE/Rn percentage was over 100 in the wide rows for August 25 and 26, 1973. The latter part of the growing season, temperature inversions above the crop canopies confirmed large-scale advection. Negative sensible heat at the beginning of the season and the below-canopy-energy balance suggest within-row advection, especially in wide row sorghum. Temperature decreased with downwind distance from a stubble field but vapor pressure increased with increasing distance. Stomatal resistance decreased and leaf-water potential increased (less negative) with downwind distance.
W79-02358

ADVECTION MODIFICATION OF THE PRIESTLEY AND TAYLOR EVAPOTRANSPIRATION FORMULA,
Wisconsin Univ.-Madison. Dept. of Soil Science.
W. A. Jury, and C. B. Tanner.
Agronomy Journal, Vol 67, No 6, p 840-842, November-December 1975. 2 fig, 7 ref.

Descriptors: *Advection, *Evapotranspiration, *Evaporation, Model studies, Radiation, Measurement, *Crop water requirements, *Net radiation, *Priestley-Taylor evaporation formula

The empirical formula of Priestly and Taylor (Mon. Weather Rev. 100:81-92, 1972) relating the evapotranspiration from a well-watered surface to the net radiation and a function of the air temperature is modified to include a saturation deficit term to account for high local advection. The model is tested on two seasons of daily evapotranspiration measurements over irrigated potatoes resulting in good agreement and a substantial improvement over the unmodified formula. Alfalfa measurements are also represented well by the model, but no better than by the Priestley-Taylor formula calibrated during a period of high advection. (Skogerboe-Colo St)
W79-02395

EVAPOTRANSPIRATION ESTIMATES FOR WATER RIGHT TRANSFERS,
Wyoming Univ., Laramie. Water Resources Research Inst
R. D. Burman, P. A. Rechard, and A. C. Munari.
In: Proceedings American Society Civil Engineers, Irrigation and Drainage Specialty Conference, Logan, Utah, Aug 13-15, 1975, p 173-195 (1975). 8 fig, 10 tab, 10 ref. OWRT B-003-WYO(5). 14-31-0001-3063.

Descriptors: *Evapotranspiration, *Water rights, *Water transfer, Irrigation, Streamflow, *Evapotranspiration estimates, *Blaney-Criddle method, Wyoming, Colorado, Nevada.

Current practice allows the transfer of seasonal evapotranspirtation minus effective rainfall when making a water right transfer from meadow irrigation to another use. This practice is equivalent to permitting the transfer of the effect of the meadow irrigation on streamflow. The Blaney-Criddle method is commonly used, with calculations made on a monthly basis. Estimates of evapotranspiration based on 15 methods were compared with measurements from four locations in Wyoming, Colorado, and Nevada. Monthly calculations were made using climatic data and lysimeter measurements. Inflow-outflow measurements made near Laramie were also used. Evapotranspiration was estimated for all months of data and for all sites. Without local calibration the Kohler, Nordenson and Fox method of estimating lake evaporation appears to be the most satisfactory method of estimating evapotranspiration from high-altitude native hay meadows. Using crop coefficients developed from Colorado, Wyoming, and Nevada, the Blaney-Criddle method appears to be the most satisfactory. Both the revised Blaney-Criddle and the Olivier methods appear to give reasonable estimates of streamflow depletion. For monthly calculations the Blaney-Criddle method with coefficients calibrated for mountain meadow conditions appears to yield satisfactory estimates
W79-02491

2E. Streamflow and Runoff

SOME COMPARISONS OF FLOOD STATISTICS IN REAL AND LOG SPACE,
Geological Survey, Reston, VA. Water Resources Div., and IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
J. M. Landwehr, N. C. Matalas, and J. R. Wallis.
Water Resources Research, Vol 14, No 5, p 902-920, October 1978. 9 fig, 30 tab, 6 ref.

Descriptors: *Floods, *Historic floods, *Simulation analysis, *Monte Carlo method, *Stochastic processes, Evaluation, Real space, Log space.

Some statistics of historical and simulated flood data were examined in real and log space. Some statistical properties of floods in real space could not be inferred from those in log space without extensive knowledge of the distribution of floods in real space as well as information about its sampling characteristics. The construction and use of regional skew maps in log space are most likely counter productive. (Woodard-USGS)
W79-02119

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div
For primary bibliographic entry see Field 7C.
W79-02121

FLOW CHARACTERISTICS OF STREAMS IN TUTUILA, AMERICAN SAMOA,
Geological Survey, Honolulu, HI. Water Resources Div.
I. Matsuoka.
Water-Resources Investigations 78-103 (open-file report), September 1978. 34 p, 7 fig, 1 plate, 6 tab, 13 ref.

Descriptors: *Streamflow, *Flow characteristics, *Low flow, *High flow, *Rainfall-runoff relationships, Hydrologic data, *American Samoa, *Tutuila.

The island of Tutuila is the economic and population center of American Samoa. It lies in the tropics and rainfall is abundant. Annual rainfall at upper Faga'alu reservoir averaged 207 inches during the period 1904-75. Available records show that altitude is a significant factor affecting the amount of rainfall. Small, steep basins generally yield perennial flow into streams but the amounts are small and sometimes highly variable. Low-flow frequency and correlation methods were used to determine flow characteristics. The total of the low-flow consecutive 7-day average discharges that can be expected at 10-year recurrence intervals at the 6 continuous-record gaging stations and the 45 partial-record stations analyzed is 5.2 cubic feet per second. About half of this total, 2.4 cubic feet per second, is from streams draining the southwestern part of the island where most of the water collection and distribution systems are being concentrated. High-flow frequency curves show the

instantaneous peak discharge of the maximum mean discharge for selected periods of consecutive days and its likelihood of occurrence. (Woodard-USGS)
W79-02124

MAGNITUDE AND FREQUENCY OF FLOODING ON THE MYAKKA RIVER, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, FL., Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-02129

FLOOD-PLAIN DELINEATION FOR CUB RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
P. L. Soule.
Open-file report 78-17, 1978. 121 p, 78 fig, 12 tab, 4 ref.

Descriptors: *Flood profiles, *Flood plains, *Flood forecasting, *Flood frequency, *Analytical techniques, Design flood, Flood routing, Flood control, *Virginia, *Cub Run basin(Va), Fairfax County(Va), *Flood-plain mapping, *Flood-plain delineation.

Flood-plain delineation for Cub Run basin water-surface profiles of the 25-, 50-, and 100-year recurrence interval discharges have been computed for all streams and reaches of channels in Fairfax County, Virginia having a drainage area greater than 1 square mile except for Dogue Creek, Little Hunting Creek, and that part of the Cameron Run above Lake Barcroft. Maps having a 2-foot contour interval and a horizontal scale of 1 inch equals 100 feet have been used for base on which flood boundaries were delineated for 25-, 50-, and 100-year floods to be expected in each basin under ultimate development conditions. This report is one of a series and presents a discussion of techniques employed in computing discharges and profiles as well as the flood profiles and maps on which flood boundaries have been delineated for the Cub Run basin in Fairfax County. (Woodard-USGS)
W79-02137

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Lower Mississippi Valley Div.
For primary bibliographic entry see Field 4A.
W79-02195

STRUCTURAL CONTROL OF THE RAPIDS AND POOLS OF THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, A. Howad, and D. Trimble.
Science, Vol. 202, No. 4368, p 629-631, November 10, 1978. 3 fig, 5 ref.

Descriptors: *Geologic control, *Colorado River, *Alluvial fans, *Colorado, Sediment load, Fractures(Geologic), Tributaries, Velocity, Bathymetry, Sounding, On-site investigations, Ponds, *Rapids, Structural control, *Grand Canyon, Debris.

Most of the major rapids along the 450 km course of the Colorado River in the Grand Canyon are within fracture zones that run perpendicular to the river. Steep tributaries flowing within the zones of bedrock weakness move large debris to the Colorado, forming the rapids. Accelerated flow through the rapids scours the deep pools that are located below them. (Visocky-ISWS)
W79-02200

FORECAST OF THE FLASH FLOOD HYDROGRAPH ON THE INGODA RIVER,
For primary bibliographic entry see Field 4A.
W79-02207

2F. Groundwater

THE ORIGIN OF LABYRINTH AND TOWER KARST AND THE CLIMATIC CONDITIONS NECESSARY FOR THEIR DEVELOPMENT,
Georgia Univ., Athens.
G. A. Brook, and D. C. Ford.
Nature, Vol 275, No 5680, p 493-496, October 12, 1978. 3 fig, 2 tab, 43 ref.

Descriptors: *Karst, *Canada, *Climates, Limestone, Dolomite, Humid climates, Subarctic, Karst hydrology, Erosion, Zoning, *Labyrinth karst, Tower karst, Karstlands, Nahanni karst, Natural rock labyrinths, Zonal climate.

A complex and accentuated karstland at 61-62 deg N in the Nahanni area of the Mackenzie Mountains, Northwest Territories, Canada, was explored and studied in 1972-74. The climate is subarctic, continental interior type, and there is a discontinuous permafrost. The findings added knowledge of karst styles and suggested that some relationships between karst morphology and climate be reassessed. A new karst style, labyrinth karst, was recognized in climates ranging from humid tropical to subarctic. These karst landscapes were identified in several humid and seasonally humid tropical carbonate terrains such as southwest Celebes, Indonesia, the Star Mountains and Lake A jamuru regions of New Guinea, and the Tanga region of Tanzania. They also were clearly visible in oblique photographs of the Sierra Maestra in Cuba and Arnhem Land, Northern Territory, Australia. In the late stages of evolution, labyrinth karst was replaced by limestone towers. This indicates that tower karst is polygenetic and not specific to the humid tropics as was once thought. (Roberts-ISWS)
W79-02073

PUBLIC GROUNDWATER SUPPLIES IN KANE COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-02075

TRITIUM IN THE WATERS OF YELLOWSTONE NATIONAL PARK,
Geological Survey, Menlo Park, CA., Water Resources Div., and Geological Survey, Menlo Park CA., Geologic Div.
F. J. Pearson, Jr., and A. H. Truesdell.
In: Short Papers of the Fourth International Conference, Geochronology, Cosmochronology, Isotope Geology, 1978: Open-file report 78-701, p 327-328, 1978. 3 fig, 1 ref.

Descriptors: *Groundwater movement, *Hot springs, *Geysers, *National parks, *Tritium, Surveys, Analytical techniques, Surface-groundwater relationships, Streams, Reservoirs, Mixing, Cold springs, *Yellowstone National Park.

Tritium content of both hot and cold waters in Yellowstone National Park was used to infer something of the ground-water system feeding hot springs and geysers. Curves in three figures show: (1) Tritium content of water leaving piston flow and well mixed ground-water systems in Yellowstone Park; (2) tritium in precipitation, mixed reservoirs, and cold waters of Yellowstone Park, and (3) tritium in mixed reservoirs and hot waters of Yellowstone Park. (Woodard-USGS)
W79-02130

GEOLOGY AND GROUNDWATER RESOURCES OF NORTHERN BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
C. R. Wood, and D. B. MacLachlan.
Pennsylvania Geological Survey, Harrisburg, Fourth Series, Water Resources Report 44, 1978. 91 p, 9 fig, 2 plates, 14 tab, 37 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Groundwater availability, *Water quality, Water utilization, Water wells, Water yield, Water level fluctuations, Surface-groundwater relationships, Groundwater recharge, Transmissivity, *Pennsylvania, Berks County(Penn).

The area of investigation is underlain chiefly by carbonate rocks in the south and by shale and graywacke in the north. Ground water is almost entirely confined to secondary openings that occur along bedding planes, faults, and other fractures. Yields of 1,000 gal/min are common in the better carbonate aquifers. Nondomestic wells in some of the poorer carbonate aquifers have median yields of less than 60 gal/min. Median yields of nondomestic wells in the noncarbonate aquifers generally range from 25 to 250 gal/min. Natural annual fluctuations of water levels in wells generally range from 3 to 20 feet. Areas of low water-level slope underlain by carbonate rocks generally coincide wtih areas of high transmissivity. Two areas of fluoride pollution result from soluble industrial wastes. Industrial wastes containing chromium polluted the water at Sinking Spring; and an area near Sinking Spring that was polluted by a gasoline spill in the early 1930's remains polluted in 1976. (Woodard-USGS)
W79-02132

MAJOR AQUIFERS IN CLARK COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, SD. Water Resources Div.
L. J. Hamilton.
South Dakota Geological Survey, Vermillion, Information Pamphlet No. 16, 1978. 7 p, 5 fig, 1 tab.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Groundwater availability, *Water utilization, Hydrologic data, Water wells, Water yield, Water levels, Chemical analysis, South Dakota, *Clark County(SD).

This information pamphlet is one of a series of reports on water-resources studies of South Dakota counties. It is designed to acquaint the reader with the general distribution, quantity, and quality of ground water available from the major aquifers in Clark County. The information is based on data collected by the U.S. Geological Survey and the South Dakota Geological Survey during the period 1973-76. Some of the physical and hydrochemical properties of six major glacial aquifers are summarized in the table. Three of the aquifers are grouped as the Prairie Coteau aquifers and the other three are grouped as the Altamont aquifers. Although most of the water in the Prairie Coteau aquifers and the Altamont aquifers is saline it has been a satisfactory supply for human and livestock consumption. The water may require treatment for other uses in order to reduce high concentrations of iron, manganese, and hardness. (Woodard-USGS)
W79-02134

POTENTIAL FOR DOWNWARD LEAKAGE TO THE FLORIDAN AQUIFER, GREEN SWAMP AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02136

GEOPHYSICAL DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN GRUNDY COUNTY, MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
O. Malvik.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 707, Price code: A06 in paper copy, A01 in microfiche. M. A. Thesis, 1977, 102 p. 24 fig, 3 tab, 29 ref, 6 append. OWRT A-097-MO(2), 14-34-0001-7053 and 7054.

Descriptors: *Aquifers, *Missouri, *Groundwater sources, Groundwater, *Geophysical exploration, *Glacial aquifers, Bedrock, *Seismic refraction, *Gravity survey, Aquifer characteristics.

Buried glacial and preglacial river valley aquifers represent the major untapped ground-water resource in northwestern Missouri. Ground-water exploration and development is hindered by scarce well log data, variable glacial drift thickness, and encroachment of saline water from the cyclical Pennsylvanian sedimentary bedrock. A multiple geophysical approach was used to delineate the incised river valleys and to make inferences on ground-water quality. Computer display of gravity residuals was used to select areas for further investigation. Gravity profiling was used to define the shape of the channel and the position of its maximum depth. Seismic refraction and resistivity soundings were then used to further evaluate the buried valleys. The interpretations of the gravity residual map were complicated by saddles between gravity lows, and some suspected buried valley locations were not verified by further geophysical investigation. Gravity surveys, however, appear to be an effective reconnaissance tool in this area. Seismic refraction gave adequate drift-bedrock interface depths where well control was available, indicating that a velocity contrast exists in the study area. Resistivity sounding has been effective in sites where adequate resistivity contrasts exist between drift and bedrock. In other sites saline water encroachment or shallow fresh water aquifers may mask this interface. This three-fold geophysical evaluation appears to be effective in this area whereas any one approach would, by itself, be of little value.
W79-02154

FLOTATION OF FRESH WATER ON SEA WATER, A HISTORICAL NOTE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. N. Davis.
Ground Water, Vol. 16, No. 6, p 444-445, November-December, 1978. 8 ref.

Descriptors: *Hydrogeology, *History, *Ghyben-Herzberg, Saline water intrusion, Freshwater, Sea water, Floating.

The historical development of the Ghyben-Herzberg principle is outlined. It was first stated by Pliny the Elder A. D. 23-79 that fresh water floats on salt water due to differences in density. However, owing to illogical statement on other matter his influence on contemporary and later thought was weak. Joseph DuCommun should receive credit for the first clear scientific explanation of the floatation of fresh ground water on sea water. DuCommun's work antedated publications by both Badon Ghyben and Herzberg by more than 60 yers. Darwin inferred the principle in writing about shallow wells which recovered fresh water from small oceanic islands in 1845. Thus, the use of the term, Ghyben-Herzberg principle tends to perpetuate an incorrect understanding of an important step in the history of hydrogeology. An impersonal term such as 'the principle of static fresh-water floatation' should be substituted. (Purdin-NWWA)
W79-02171

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
For primary bibliographic entry see Field 4B.
W79-02185

FOSSIL GROUND-WATER GRADIENTS IN ARID REGIONAL SEDIMENTARY BASINS,
Birmingham Univ. (England). Hydrogeology Section.
J. W. Lloyd, and M. H. Farag.
Ground Water, Vol. 16, No. 6, p 388-393, November-December 1978. 5 fig, 1 tab, 16 ref.

Descriptors: *Groundwater movement, *Hydraulic gradient, *Arid lands, *Resistance networks, *Sedimentary basins(Geologic), Permeability, Specific yield, Carbon radioisotopes, Analog models, Groundwater resources, Groundwater recharge, Model studies, *Groundwater gradients, *Fossil gradients, Recharge mounds.

The hypothesis that present-day groundwater gradients in arid regional sedimentary basins are a decay feature of very old recharge mounds was examined using a resistance network analog. A longitudinal section model of a conceptual basin with some specific control of aquifer permeability and groundwater age was used. With reasonable combination of aquifer permeability and specific yield, it was shown that an acceptable head decay could have occurred over the past 10,000 years to produce the present-day gradient. In the model adopted, decreasing permeability with depth was found to be required to accord with 14C groundwater age data. Although the model is not considered to be definitive for any particular aquifer, the results showed that fossil gradient conditions could exist in the regional basins for long periods and should be taken account of in groundwater resources assessments. (Visocky-ISWS)
W79-02189

THE BLIND ZONE IN SEISMIC GROUNDWATER EXPLORATION,
James Madison Univ., Harrisonburg, VA. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W79-02190

TRANSIENT SPHERICAL FLOW TO A NONPENETRATING WELL WITH CONSTANT DRAWDOWN,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W79-02191

THE IMPACT OF THE USE OF HEAT PUMPS ON GROUNDWATER TEMPERATURES,
Northern Cheyenne Research Project, Lame Deer, MT.
For primary bibliographic entry see Field 4B.
W79-02192

ROLE OF GROUND WATERS IN THE FORMATION OF THE TOTAL RUNOFF OF A SMALL DRAINAGE BASIN IN THE FOREST ZONE,
For primary bibliographic entry see Field 4B.
W79-02211

LONG-PERIOD GROUND-WATER REGIME IN THE EXCESSIVELY WET ZONE OF THE EUROPEAN USSR,
E. A. Zal'tsberg.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 64-67, 1977. 1 fig, 1 tab, 7 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 19, No. 2, p 137-142, 1977.

Descriptors: *Groundwater, *Water level fluctuations, *Water table, *Frequency analysis, Hydrogeology, Cycles, Wet climates, Analysis, Analytical techniques, Statistical methods, Foreign research, Foreign countries, Time, Groundwater resources, *USSR.

Investigated is the relatively little known problem of the long-period cyclicity (periodicity in a particular case) of the groundwater regime in the excessively wet zone of the European USSR. Various methods are used to identify the cyclic (periodic) components in long-period observations, namely: construction of difference-integral curves, smoothing from moving n-year periods, and correlation, harmonic, and spectral analyses. The results of harmonic analysis and some additional data on the cycles were tabulated. Long-period fluctuations in the levels of ground and surface waters have the same main cause, i.e., cyclic climatic variations. Therefore, there is a definite similarity between these fluctuations. Having identified some cycle in long meteorological or surface water observation series, one can state with great probability that a cycle of the same (or close) duration must also be manifest in groundwater fluctuations. Three-year cycles of high amplitude, found in the fluctuations of the pre-spring groundwater level minima, are as distinctly revealed in winter air temperature series, according to the Lenigrad meteorological station. Consequently, the characteristics of the frequency structures of series of regime-forming factors are reflected in the frequency structure of groundwater level series. Periods of different duration (generally cycles), identified in groundwater level fluctuations, are caused to some extent by individual regime-forming factors and by the simultaneous effect of the combination of these factors. (Humphreys-ISWS)
W79-02212

AN EVALUATION OF ISOTOPE CONCENTRATIONS IN THE GROUND WATER OF SAUDI ARABIA,
Geological Survey, Riyadh (Saudi Arabia). Water Resources Div
W. J. Shampine, T. Dincer, and M. Noory.
In: Proceedings of the International Symposium on Isotope Hydrology, held in Neuherberg, Federal Republic of Germany, June 19-23, 1978. 16 p, 9 fig, 2 tab, 16 ref.

Descriptors: *Groundwater, *Water quality, *Stable isotopes, *Dating, *Aquifers, Foreign countries, Deuterium, Tritium, Groundwater movement, Groundwater resources, Evaluation, Reviews, *Saudi Arabia, Umm-Er-Radhuma aquifer, Wasia aquifer, Neogene aquifer, Khobar aquifer, Oxygen-18, Sulfur-34, Carbon-13, Carbon-14.

Data on concentrations of oxygen-18, deuterium, tritium, sulfur-34, carbon-13, and carbon-14 have been collected in varying amounts from groundwater samples at more than 400 sites in Saudi Arabia. These data were collected during several hydrologic studies conducted in Saudi Arabia since 1967, most of which studied selected areas of the Arabian Shelf area of the kingdom. No new data were collected for this study, but all of the hydrologically oriented isotope data available in the kingdom have been compiled and summarized. A general assessment of the data is made which is useful to evaluate the quantity and quality of the data available as well as to indicate potential areas for future work. The compiled data also have permitted a general evaluation of the isotopic characteristics of the water in large, regional aquifer systems (about 800,000 sq km). (Woodard-USGS)
W79-02254

GROUND WATER...CALIFORNIA'S PRICELESS RESOURCE,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4B.
W79-02392

LAND SUBSIDENCE DUE TO WATER WITHDRAWAL IN THE VICINITY OF PECOS, TEXAS,
Cornell Univ., Ithaca, NY. Dept. of Engineering; and Cornell Univ., Ithaca, NY. Dept. of Applied Physics.
For primary bibliographic entry see Field 4B.
W79-02396

2G. Water In Soils

SUGAR CANE GROWTH IN RESPONSE TO MULCH AND FERTILIZER ON SALINE-ALKALI SUBSOILS,
Ministry of Overseas Development (England).
For primary bibliographic entry see Field 3C.
W79-02029

DISAPPEARANCE OF NITRATE UNDER TRANSIENT CONDITIONS IN COLUMNS OF SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
H. E. Doner.
Soil Biology and Biochemistry, Vol. 7, No. 4-5, July 1975. p 257-259. 3 fig, 8 ref.

Descriptors: *Nitrates, *Flow rate, Soil investigations, Soil chemistry, Leaching, Soil texture, Nitrogen, *Soil columns, *Transient flow conditions(Soils).

Previously a rapid reduction of NO3 was obtained in soil columns with continuous flow, before the establishment of steady state conditions. This initial behavior was not a function of flow rates. In order to determine what influence NO3 concentrations might have on transient and steady state rates, of NO3 loss, small soil columns were infiltrated with 0, 100 and 1000 micrograms ml(-1)NO3-N and the effluents were analyzed daily for NO3 and NO2. (Skogerboe-Colo St)
W79-02122

VOLATILITY OF MERCURY FROM SOILS AMENDED WITH VARIOUS MERCURY COMPOUNDS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5B.
W79-02142

INVESTIGATION OF MATRIX INTERFERENCES FOR AAS TRACE METAL ANALYSES OF SEDIMENTS,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-02143

STREAMING-POTENTIAL EFFECTS IN SATURATED WATER FLOW THROUGH A SAND-KAOLINITE MIXTURE,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
S. Gairon, and D. Swartzendruber.
In: Ecological Studies. Analysis and Synthesis. Vol. 4, Edited by A. Hadas et al. Springer-Verlag Berlin - Heidelberg - New York p 141-151, 1973, 6 fig, 1 tab, 14 ref. OWRT B-005-IND(3).

Descriptors: Flow, *Saturated flow, *Porous media, Electrical properties, Electric fields, Sand, Kaolinite, *Streaming potential, *Electrical Potential difference.

The electrical potential difference across a permeameter filled with a mixture of 12.5% kaolinite and 87.5% sand was measured for saturated flow of water containing 20 ppm of mercuric chloride. Measurements were taken continuously for alternate periods of rest and flow ranging from as small as 15 min to as large as 24 hr. Both silver-silver-chloride and bright plantinum electrodes were placed in the end reservoirs of the permeameter to obtain electrical measurements, and the entire flow apparatus was enclosed in a grounded copper-screen Faraday cage. Even so, electrical potential differences observed continuously over 24-hr periods showed considerable variation with both types of electrodes. The only consistent response, qualitatively and quantitatively, was the step change in electrical potential at the time of initiation or cessation of hydraulic flow. The direction and magnitude of this 'E step' were consistent with those of the streaming-potential phenomenon. The magnitude of the E step was essentially proportional to the hydraulic gradient causing the liquid flow, and was thus in conformity with classical double-layer theory. Water flux also was closely proportional to the hydraulic gradient.
W79-02160

SIMULATED FLOW THROUGH THE ROOT XYLEM,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
For primary bibliographic entry see Field 2I.
W79-02199

COMPUTATION OF SOIL FREEZING DEPTH IN THE ZONE OF AERATION,
For primary bibliographic entry see Field 2C.
W79-02215

THE NATURE OF BASALT WEATHERING IN ISRAEL,
Hebrew Univ., Jerusalem, Rehovoth (Israel). Dept. of Soil and Water Science.
A. Singer.
Soil Science, Vol. 125, No. 4, p 217-225, April, 1978. 5 fig, 17 ref.

Descriptors: *Weathering, Soil formation, *Basalts, Aeolian soils, Saprolites, Clay minerals, Quartz, *Israel

Three major weathering forms of upper Cenozoic basalts are recognized: a weathering crust, several millimeters thick, at the interface with the massive basalt; a weathering zone, several centimeters thick, associated with vesicular basalt; and thoroughly altered basalt saprolite, mostly obtained under prolonged water-saturated conditions. The clay fractions in the weathering crust and zone consist of smectite and kaolinite with halloysite, while, in the saprolite, smectite is the only clay mineral formed. Si02/A1203 ratios change from 6-7 in the rock to 2-3 in the crust clay, and this decrease represents maximum desilication obtained under eastern Mediterranean conditions. With soil development, a resilication of soil clays relative to crust clay may take place in the deeper stable profiles. Soil development also involves aeolian accumulation of quartz in the coarser size fractions, and Fe and K enrichment in the clay fraction. Grumusols (Vertisols) represent the mature, stable end products of basalt weathering on uneroded surfaces in the semiarid and subhumid parts of the eastern Mediterranean. In the more humid parts, Red and Brown Mediterranean soils (Xeralfs) become dominant. (Skogerboe-Colorado State)
W79-02238

A COMPUTER SIMULATION OF PHOSPHATE AND NITROGEN TRANSPORT BY WATER RUNOFF,
Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
For primary bibliographic entry see Field 5B.
W79-02251

THE ORGANIC SEDIMENTS OF CORKSCREW SWAMP SANCTUARY,
Central and Southern Florida Flood Control District, West Palm Beach, FL.
For primary bibliographic entry see Field 2H.
W79-02284

DISSOLVED HYDROGEN SULFIDE IN SOIL WATER IN SAN FELASCO HAMMOCK AND DEERHAVEN CYPRESS DOME,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5B.
W79-02285

APPLICATION OF THE ELECTRICAL DOUBLE LAYER THEORY TO PREDICT ION ABSORPTION IN MIXED IONIC SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W79-02314

CHEMICAL CHARACTERIZATION OF LOCAL AND STRATOSPHERIC PLUTONIUM IN OHIO SOILS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W79-02320

THE BEHAVIO OF SULFATE ON SALT INPUT IN PODZOLIC BROWN EARTH,
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldenaehrung.
For primary bibliographic entry see Field 2K.
W79-02321

MATERIAL CONTENT OF BINARY PHYSICAL MIXTURE AS MEASURED WITH A DUAL-ENERGY BEAM OF GAMMA RAYS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
D. L. Nofziger, and D. Swartzendruber.
Journal of Applied Physics, Vol 45, No 12, p 5443-5449, December 1974. 6 fig, 1 tab, 15 ref. OWRT B-014-IND(8).

Descriptors: *Instrumentation, *Soil moisture meter, *Gamma rays, Soil moisture movement, Equipment, Cesium, *Dual-energy beams, Soil moisture measurement, Soil density, Americium.

The content of water and soil in physical intermixture was measured simultaneously and nondestructively by the attenuation of a dual-energy beam of gamma rays. The beam, 1 mm by about 3 cm in cross section, was devised by placing a 280-mCi source of 137Cs behind a 389-mCi source of 241Am, with lead collimators suitably aligned in front of each source and the scintillation probe. The probe was connected in parallel to two-separate amplifier-analyzer-scaler systems, one being set in the integral mode to receive all pulses greater than 550 keV (for 137Cs, 662-keV peak), with the other being set in the differential mode to receive all pulses in a band 35-85 keV (for 241Am, 60-keV peak). When related to the count intensity in the high-energy range, the count intensity caused by 137Cs in the low-energy band was empirically found to be independent of the material in the binary mixture (soil and/or water) placed in the beam for measurement. Also, e could be well expressed by a cubic polynomial that was then used along with a dead-time correction to determine the attenuated count intensity attributable to the 241 Am source alone. Calibration of the system was then possible. Over-all measuring accuracy was on the order of plus or minus 0.01 cm3/cm3 in water content and plus or minus 0.04 cm3 or g/cm3 for a counting period of 5 sec.
W79-02356

ELECTRICAL POTENTIALS DURING WATER ENTRY INTO AN AIR-DRY MIXTURE OF SAND AND KAOLINITE,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
D. Swartzendruber, and S. Gairon.
Soil Science Vol. 120, No. 6, p 407-411, 1975. 4 fig, 3 ref. OWRT B-005-IND(4).

Descriptors: *Water flow, *Saturated flow, *Porous media, Electrical properties, Electrical fields, Sand, Kaolinite, Seepage, *Streaming potential, *Electrical potential difference.

Electrical potentials were observed for the upward entry of water into columns of air-dry mixtures of sand and kaolinite. The electrical potential difference was measured between two bright platinum electrodes, one being in the water chamber at the inlet (lower) end of a column, and the other being one of five separate electrodes placed in the sand-kaolinite at various positions along the column. Time records of electrical potential at the various electrodes, obtained with a high-resistance electrometer and a strip-chart recorder, exhibited characteristic negative peaks that could be very closely associated with the arrival of the visual wet front at the various electrodes. Thus, although the observed electrical potentials cannot be used to infer streaming potentials for the unsaturated flow process of water entry into air-dry soil, it does appear that such potentials can be used to trace quantitatively the progress of a wet front through the soil, under circumstances wherein visual observations are not possible or feasible.
W79-02357

MECHANISM OF ZINC ADSORPTION BY IRON AND ALUMINUM OXIDES,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 2K.
W79-02359

REACTION PRODUCTS AND SOLUBILITY OF APPLIED ZINC COMPOUNDS IN SOME MANITOBA SOILS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 2K.
W79-02362

RESIDUAL FORMS OF FERTILIZER NITROGEN IN FIELD SOILS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 2K.
W79-02364

HULA VALLEY PEAT: REVIEW OF CHEMICAL AND GEOCHEMICAL ASPECTS,
Hebrew Univ., Jerusalem (Israel) Dept. of Organic Chemistry.
For primary bibliographic entry see Field 2K.
W79-02365

REDUCTION OF NITRATE IN A SOIL COLUMN DURING CONTINUOUS FLOW,
California Univ., Berkeley. Dept. of Biology.
M. S. Ardakani, L. W. Belser, and A. D. McLaren.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 290-294, March-April 1975. 5 fig, 21 ref.

Descriptors: *Nitrates, *Denitrification, Soil environment, Soil investigations, Bacteria, Soil tests, Soil bacteria, Soil chemistry, Loam, Nitrogen, *Soil columns. Nitrate-nitrogen.

A column packed with a homogeneous Hanford sandy loam soil was perfused continuously with a solution containing 200 ppm NO3(-)-N and 2400 ppm glucose-C. Weekly estimates of denitrifiers showed that populations increased from 10(2) to > 10(8)/g of soil. Denitrifiers were most abundant near the surface where NO3(-)-N almost totally disappeared from the soil solution. An organic matter profile characterized by a surface layer developed within 3 weeks. Accumulated organic N accounted for about 4% of the total applied NO3(-)-N while the remaining 96% disappeared, presumably by dissimilation, within the top 0.5 cm of the surface layer. Normalized rate constants from 1.2 times 10(-5) ppm/hour cm3 per organism were estimated for dissimilation of NO3(-)N from its profiles. In a similar experiment, but without added glucose, less of the NO3(-)-N disappeared from solution; the percentage decreased from 40 to 15% with time. (Skogerboe-Colo St)
W79-02366

DIFFERENTIAL EFFECT OF BERMUDA AND BAHIAGRASSES ON SOIL CHEMICAL CHARACTERISTICS,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W79-02381

MODEL FOR DECOMPOSITION OF ORGANIC MATERIAL BY MICROORGANISMS,
Utah State Univ., Logan. Ecology Center.
H. Parnas.
Soil Biology and Biochemistry, Vol 7, No 2, p 161-169, March 1975. 8 fig, 1 tab, 11 ref.

Descriptors: *Model studies, *Decomposing organic matter, Organic matter, *Microorganisms, Soil investigations, *Microbial degradation, *Mineralization.

A theoretical model which gives the rate of microbial decomposition of organic material (plant or animal residues, or soil organic matter) is presented. Explicit equations for the rate of decomposition, mineralizations, and immobilization are given. The main assumption of the model is that the rate of decomposition of any substrate is proportional to the growth rate of its decomposers. Some results of the model are: (1) Addition of extra nitrogen to materials poor in nitrogen increases their rate of decomposition; (2) Addition of extra nitrogen to a substrate whose initial carbon/nitrogen ratio is above a critical ratio (20-30) causes a decrease in the substrate's carbon/nitrogen ratio during its decomposition; (3) If the initial carbon/nitrogen ratio is below the critical one, no change in the substrate's ratio will occur with time. All the model results are analytical and independent of the values for the various parameters. Nevertheless the application of the model to real field conditions is discussed while presenting a numerical example. (Skogerboe-Colo St)
W79-02415

FIELD PERSISTENCE AND MOVEMENT OF TRIFLURALIN IN TWO SOIL TYPES,
Tennessee State Univ., Nashville.
D. R. Duseja, and E. E. Holmes.
Soil Science, Vol 125, No 1, p 41-48, January, 1978. 1 fig, 8 tab, 27 ref.

Descriptors: *Herbicides, Weed control, Weeds, Johnson grass, Oats, Movement, Persistence, Trifluralin, Soil types.

Trifluralin (alpha, alpha, alpha-trifluoro-2, 4, dinitro-N, N-dipropyl-p-toluidine) was applied in 1973 to Egam load and Beason clay field plots. Trifluralin persistence and movement in both soils was essentially the same, even though higher herbicide rates were applied to Beason clay, according to manufacturer's recommendations. There was an increasing trend of herbicide residues with excessive rates of trifluralin application. The herbicide essentially dissipated from soils in 5 months, with only 2.1 percent and 0.4 percent of the initially applied amounts remaining in the soil profile, in the Egam and Beason soils, respectively, at the highest (two times) rate of herbicide application. No herbicide was detected in the soil the following spring (11 months after application). Herbicide persistence could be described by a first-order kinetics. Downward movement of trifluralin under the conditions of this experiment did occur to the 8 in depth; further penetration of herbicide was essentially nil. Apparently, upward movement of trifluralin also occurred under these conditions. The control of Johnson grass and two broadleaf weed species present in the soil lasted from four to five weeks only. (Skogerboe-Colorado State)
W79-02417

ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS: SOIL RELATIONSHIPS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
For primary bibliographic entry see Field 6G.
W79-02429

EFFECTS OF TEMPERATURE AND TIME ON HYDROXY ALUMINUM PHOSPHATE-MONTMORILLONITE COMPLEX,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
M. D. Webber.
Soil Science, Vol 125, No 2, p 107-114, February, 1978. 3 fig, 3 tab, 16 ref.

Descriptors: *Montmorillonite, *Aluminum, *Phosphates, *Clay minerals, Temperature, Time, Solubility, Suspension, Aerobic conditions, Acidic soils.

Hydroxy aluminum phosphate-montmorillonite complex persisted for 320 days in aqueous aerobic suspensions that exhibited a pH range of 2.5 to 3 and were maintained at 10, 25, and 35C. There were small changes in its chemical and x-ray diffraction properties with time, and these occurred more quickly as the temperature was raised. It persisted for 100 to 200 days at 50C, but then variscite formed and interlayer material disappeared from the clay. Solubility calculations indicated that preparations containing the complex were undersaturated with respect to gibbsite and supersaturated with gibbsite, but saturated with variscite. Seeding the preparations with variscite and aging at 25C did not cause variscite to form. It is postulated that amorphous hydroxy aluminum phosphate, which is an important soil-fertilizer reaction product and a good source of phosphorus for plants on neutral soil, is likely to persist indefinitely in temperate acid soils. (Skogerboe-Colorado State)
W79-02436

YIELD RESPONSE TO SOIL WARMING: AGRONOMIC CROPS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W79-02490

WATER INFILTRATION INTO UNIFORM AND STRATIFIED SOILS I. REVIEW AND USE OF AN APPROXIMATE THEORY,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
M. Asseed, and D. Swartzendruber.
The Libyan Journal of Agriculture, Vol 3, p 19-26. 1974. 2 fig, 20 ref. OWRT A-004-IND(7).

Descriptors: *Water infiltration, *Water content, *Hydraulic conductivity, *Unsaturated flow, Diffusivity, Conductivity, Soil water movement, Least squares method, Approximation method, Soil horizon, *Green-Ampt Equation, *Approximate theory, Soil strata

The equations of the approximate infiltration theory of Green and Ampt are much simpler than the mathematical forms of the diffusivity-conductivity theory of soil-water movement, and also involve parameters of characterization that are easier to measure experimentally. For cumulative water infiltrated into uniform soil as a function of time, these parameters are: the initial water content of the soil, the constant mean water content behind the wet front, a soil constant akin to the hydraulic conductivity of nearly saturated soil, and an equivalent constant head of water arising from the capillary properties of the soil. For fitting of the Green and Ampt equation to experimental infiltration data, a least-squares approach was developed, and was found to work very satisfactorily for measurements made on sand-silt mixtures. The approximate theory was applied to infiltration into stratified soils, thus involving the parameters of characterization of each stratum. Analysis was carried out for two and three strata, and can be continued for as many strata as desired. The resulting equations, however, become increasingly complicated, especially for the larger values of time at which the wet front has advanced into successively deeper strata. (See also W79-02493)
W79-02492

WATER INFILTRATION INTO UNIFORM AND STRATIFIED SOILS II. EXPERIMENTAL EVALUATION OF AN APPROXIMATE THEORY,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
M. Asseed, and D. Swartzendruber.
The Libyan Journal of Agriculture, Vol 4, p 129-140, 1975. 5 fig, 4 tab, 6 ref. OWRT A-004-IND(8).

Descriptors: *Water infiltration, *Water content, *Hydraulic conductivity, *Unsaturated flow, Diffusivity, Conductivity, Soil water movement, Least squares method, Approximation method, Soil horizon, *Green-Ampt equation, Approximate theory, Soil strata.

Downward infiltration of water into laboratory flow columns was studied experimentally for two different sand-silt mixtures designated as 'coarse' and 'fine' Data were taken to assess the validity of infiltration equations derived by the Green and Ampt approach for both uniform and stratified columns. For uniform columns, the equation for cumulative water infiltrated versus time accommodated the experimental data very well, and was fitted by least squares. Two characterizing constants are C, which is akin to a hydraulic conductivity, and P, which arises from the capillary of the porous material. Although both C and P exhibited as much as a 2-fold variation for a given material, their respective mean values distinguish very well between the coarse and fine mixtures and also provided the correct sense of C being markedly

smaller for the fine material than for coarse, and of P being larger for fine material than for coarse. For stratified columns, the corresponding equations were tested by predicting cumulative water infiltration versus time, based upon the parameters C and P determined from uniform columns. These predictions agreed reasonably well with the direct measurements on the stratified columns, with one exception for a fine-over-coarse stratification after the wet front had penetrated into the coarse substratum relatively deeply in comparison with the thickness of the fine upper stratum. (See also W79-02492)
W79-02493

2H. Lakes

A DYNAMIC LAKE MODEL FOR TROPHIC STATE PREDICTION,
Eidgenoessische Anstalt fuer Waserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W79-02006

EXAMINATION OF A LAKE MODEL,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W79-02007

A SIMULATION MODEL FOR PHYTOPLANKTON GROWTH AND NUTRIENT CYCLING IN EUTROPHIC, SHALLOW LAKES,
For primary bibliographic entry see Field 5C.
W79-02008

ORGANISM PATCHINESS IN LAKES RESULTING FROM THE INTERACTION BETWEEN THE INTERNAL SEICHE AND PLANKTONIC DIURNAL VERTICAL MIGRATION,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
For primary bibliographic entry see Field 5C.
W79-02009

A MATERIAL BALANCE STUDY OF POLYCHLORINATED BIPHENYLS IN LAKE MICHIGAN,
Dow Chemical Co., Midland, MI. Environmental Science Research Lab.
For primary bibliographic entry see Field 5C.
W79-02017

PREDICTION OF PHYTOPLANKTON PRODUCTIVITY IN LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W79-02055

VEGETATION CHANGES IN A SMALL MICHIGAN BOG FROM 1917 TO 1972,
Michigan Univ., Pellston. Biological Station.
C. R. Schwintzer, and G. Williams.
The American Midland Naturalist, Vol 92, No 2, p 447-459, October, 1974. 2 fig, 2 tab, 17 ref.

Descriptors: *Vegetation, *Bogs, *Succession, *Michigan, Flooding, Drainage, Water levels, Weather patterns, Trees, Mortality, Marshes, Wetlands, Bog forest, Chamaedaphne.

Quantitative descriptions of the vegetation and maps of the pool of Bryant's Bog are available for several years since 1917 providing an opportunity for direct observations of bog succession. The vegetation advanced into the bog pool in an irregular manner at an average rate of 2.1 cm/year. In 1972 the pool was 76% of its extent in 1926. The vegetation changed in a successional series from the Chamaedaphne association of 1917 to the high bog-shrub association in the dry years of the 1920's to a bog forest which was well established in the late 1960's. It regressed in the early 1970's when many of the trees died and the Chamaedaphne association appeared to be re-establishing itself. The most probable cause of tree mortality was flooding caused by exceptionally high water levels due to natural weather cycles. Tree mortality was also found in Hoop Lake Bog - which, like Bryant's Bog, lacks aboveground drainage - while none occurred in bogs with aboveground drainage. (Maroncelli-Mass)
W79-02091

AQUATIC INVERTEBRATE ABUNDANCE IN RELATION TO CHANGING MARSH VEGETATION,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
D. K. Voigts.
The American Midland Naturalist, Vol. 95, No. 2, p 313-322, April, 1976. 1 fig, 1 tab, 28 ref.

Descriptors: *Aquatic animals, *Invertebrates, *Marsh plants, *Waterfowl, Wildlife, Crustaceans, Gastropods, Aquatic insects, Nesting, Aquatic vegetation, Rooted aquatic plants, Freshwater plants, Vegetation, Submerged plants, Floating plants, Marshes, Iowa, Emergent vegetation, Avian nesting, Avian nesting season.

The relationship between invertebrate populations and vegetative cover was studied in several Iowa marshes during the peak of the avian nesting season. Shallow water with emergent and floating dead vegetation produced the most isopods, planorbid snails and physid snails. Physid snails had another abundance peak in areas where submerged plants were found below dense free-floating plants. Midges reached greatest abundance in more open habitats somewhat protected from the wind. Amphipods were the most numerous invertebrate taxa and were most abundant in dense beds of submerged vegetation. Cladocera and copepods were most common in quiet pools with little vegetation. Total invertebrate abundance increased as the emergent vegetation was replaced by submerged vegetation, but maximum numbers occurred where beds of submerged vegetation were interspersed with stands of emergent vegetation. It is suggested that nesting marsh birds are attracted to marshes that produce the most invertebrates. (Maroncelli-Mass)
W79-02095

GEOGRAPHIC VARIATIONS IN SALT MARSH MACROPHYTE PRODUCTIONS: A REVIEW,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
R. E. Turner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 795, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. LSU-R-76-015, 1976. Reprinted from: Contributions in Marine Science, Vol. 20, p 47-68, 1976. 9 fig, 7 tab, 74 ref.

Descriptors: *Primary productivity, *Rooted aquatic plants, *Atlantic coastal plain, *Gulf coastal plain, *Reviews, Aquatic plants, Wetlands, Marshes, Biomass, Spartina alterniflora, Over-wintering biomass, Reviews, Bibliographies.

A literature review of salt marsh macrophyte production measurements supports the conclusion of a north-south gradient which parallels solar energy inputs at a 0.20-0.35% net conversion efficiency. There is also a latitudinal gradient of live biomass which over-winters. Considerable variation exists within and among marshes. Methods previously employed to measure salt marsh macrophyte production have generally under estimated the actual net above-ground production because of an inability to account for the turnover of live material between sampling periods. Turnover apparently increases with decreasing latitude and may be equal to annual changes in standing live biomass. The effect of other factors influencing production are discussed and a detailed data review presented. (Stihler-Mass)
W79-02098

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
For primary bibliographic entry see Field 5C.
W79-02103

WATER LEVEL FLUCTUATION IN A NORTHEASTERN ONTARIO PEATLAND,
Toronto Univ. (Ontario). Dept. of Botany.
T. S. Dai, V. F. Haavisto, and J. H. Sparling.
Canadian Journal of Forest Research, Vol. 4, No. 1, p 76-81, March, 1974. 5 fig, 13 ref.

Descriptors: *Water level fluctuations, *Bogs, Wetlands, Fen, Water levels, Runoff, *Peatlands, *Ontario, *Canada.

Depths to water level and changes due to local climate were dissimilar in five peatland conditions--kale surface, black spruce bog, stagnant spruce site, lagg area, and poor fen. The deepest water level and the greatest fluctuations occurred in the ombrotrophic black spruce bog. The sedge-dominated poor fen site was submerged following every heavy rain; waterlogged conditions remained with 6 cm of the surface at all times because of the influence by the water level of Dai Lake. Water level of the lagg site was above the surface following every heavy rain during a 12-day period in early August. This site was affected by continuous inflow, high water levels, and fast runoff, therefore, a large flucutation of water level prevailed at this site. The water level of Dai Lake varied with a narrow range because the loss of water was primarily dependent on slow seepage and evaporation. Lowest water level during the summer of 1967 was recorded on July 11 at every site. (Stihler-Mass)
W79-02105

FORESTED WETLANDS OF FLORIDA-THEIR MANAGEMENT AND USE,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 6B.
W79-02112

THE PRODUCTIVITY OF LAKE CHAMPLAIN WIT REGARD TO WATERFOWL, FURBEARERS, AND OTHER WILDLIFE,
Vermont Dept. of Fish and Game, Montpelier.
T. R. Myers, and D. D. Foley.
Prepared under contract to Fish and Wildlife Service, Newton Corner, Massachusetts, for the International Joint Commission, August, 1977. 175 p, 7 fig, 55 tab, 281 ref. 14-16-0005-6056.

Descriptors: *Wetlands, *Lakes, *Wildlife habitat, *Water level fluctuations, Wildlife, Waterfowl, Water levels, Reservoir management, Furbearers, Aquatic animals, Marsh plants.

Of concern to waterfowl, furbearers, and other wildlife dependent upon wetland habitat along Lake Champlain is the potential for loss or drying out of wetlands as a direct result of proposed lake level regulation. From the stage-area information generated from the study, it is significant that substantial acreages of productive wetlands lie at contour intervals above maximum spring high limits allowed under regulation plans being considered. Should these areas receive no further periodic inundation, they would fall to retain their wetland charcter and revert to terrestrial vegetative types. The end product would be a vastly diminished wetland resource adjacent to Lake Champlain with considerable adverse impact on higher and lower life forms dependent on this wetland complex. Composition and quality of remaining wetland habitat could be substantially different with regard to meeting wildlife needs. (Steiner-Mass)
W79-02114

APPARENT USE OF SEDIMENT NITROGEN AND PHORPHORUS BY PLANTS IN MALLETTS CREEK MARSH WITH IMPLICA-

TIONS TO LAKE CHAMPLAIN WATER LEVEL REGULATION,
Geological Survey, Albany, NY.
J. T. Turk.
Prepared under contract to Fish and Wildlife Service, Newton Corner, Massachusetts, for the International Joint Commission, August, 1977. 19 p, 10 fig, 10 tab, 9 ref.

Descriptors: *Nitrogen, *Phosphorus, *Marsh plants, Wetlands, Marshes, Freshwater marshes, Rooted aquatic plants, Nutrients, Nutrient cycling.

Nitrogen and phosphorus dissolved in the interstitial water of the marsh sediments are a significant source of nutrients for rooted macrophytes and are capable of supplying 42 and 9 percent, respectively, of the plant requirements. During periods of low surface-water input in mid- and later-summer, interstitial nitrogen and phosphorus may supply an even larger percentage of the plant nutrient requirements. Excessive fluctuations in water level in the spring or early summer could increase the supply of nitrogen and phosphorus to Lake Champlain and decrease the growth of rooted macrophytes within the marsh. (Steiner-Mass)
W79-02115

LIMNOLOGY OF SELECTED LAKES IN OHIO - 1975,
Geological Survey, Columbus, OH., Water Resources Div.
R. L. Tobin, and J. D. Youger.
Water-Resources Investigations 77-105 (open-file report), September 1977. 205 p, 48 fig, 90 tab, 78 ref.

Descriptors: *Ohio, *Lakes, *Limnology, *Water quality, *Thermal stratification, Water chemistry, Nutrients, Phytoplankton, Algae, Bacteria, Pesticides, Anaerobic conditions, Dissolved solids, Dissolved oxygen, Cations, Anions, Coliforms, Light penetration, Secchi disks, Inflow

Seventeen Ohio lakes were evaluated in 1975 for water quality status. Spring and late summer data included physical and profile measurements for a broad spectrum of chemical and biological constituents. Secchi disk transparency ranged from 0.1 to 2.9 meters. Thermal stratification or stability is shown for 10 lakes deeper than 4.6 meters. Anaerobic conditions, and high concentrations of ammonia, carbon dioxide, and hydrogen sulfide, developed in all thermally stabilized lakes. Maximum dissolved oxygen was measured at 20.8 milligrams per liter (229 percent saturation) in Paint Creek Lake. Calcium was the dominant and (or) codominant cation and bicarbonate and (or) sulfate the dominant anions in all lakes sampled. Two lakes, Hope and Vesuvius, had soft water. Specific conductance ranged from 128 to 510 micromhos. Pesticides were not detected except in Action Lake, and concentrations of one or more trace metals were above State limits in 10 lakes. Fecal coliform counts were generally low and exceeded 400 colonies per 100 milliliters in four lakes during runoff events. Blue-green algae dominated the summer phytoplankton communities in 16 lakes, with maximum densities greater than two million cells per milliliter. (Woodard-USGS)
W79-02126

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-02152

TRACE ELEMENT OF THE SARDIS RESERVOIR, MISSISSIPPI, AS RELATED TO CLAY MINERAL DISPERSION,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
W. R. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 705. Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Mississippi State University, Mississippi State. Report October 1978, 62 p, 12 fig, 13 tab, 26 ref. OWRT A-115-MISS(1), 14-34-0001-8026.

Descriptors: *Reservoirs, Sedimentation, Geochemistry, *Trace elements, *Distribution patterns, Migration, Profiles, *Sediment distribution, Sediments, *Geochemistry adsorption, Surfaces, Sorption, Expansive clay, *Clay minerals, Sediments, Reservoirs, Illite, Kaolinite, Montmorillinite, Cation adsorption, *Mississippi, *Sardis Reservoir(Miss), *Bottom sediments.

Bottom sediment of Sardis Reservoir which is located in Northcentral Mississippi has a mineral composition as determined by x-ray diffraction of quartz, feldspar, calcite and the clay minerals montmorillonite, kaolinite and illite. The clays together are the dominant fraction of which kaolinite is the dominant species. Trace element content is restricted to the clay fraction and includes Mg, Zn, Ni, Ca and Fe. Lead and copper were also detected but only in a few samples. Concentrations of trace elements were determined by atomic absorption spectrophotometry. Entropy ratio mapping of sediment mineralogy revealed nearly complete mixing of all minerals, especially those of the clay group. Multiple regression analysis of trace element composition suggested natural contribution only from multiple land sources with complete mixing for some elements and spastic mixing for others in the reservoir proper. Summer thermal stratification of Sardis water controls only the deposition of iron. Otherwise, the depositional behavior of the remaining elements can mostly be related to the dispersion of clay. High and equal covariance was found between Mg, Zn, and Fe (winter deposition only) which indicates identical behavior. Furthermore, there is excellent correlation between these elements and montmorillonite. Moderate correlation was found between Ni and kaolinite. Calcium, however, could not be related to any of the clay species. Finally, there was no evidence for a relation between illite and any of the trace elements
W79-02187

TIRE MODULE SYSTEMS IN SHORE AND HARBOR PROTECTION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W79-02201

SIMULATION MODEL OF CRYPTOMONAS OVATA POPULATION DYNAMICS IN SOUTHERN KOOTENAY LAKE, BRITISH COLUMBIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W79-02225

WIND INDUCED DISPERSION AND ALGAL GROWTH IN SHALLOW LAKES,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering
For primary bibliographic entry see Field 5G
W79-02226

A PATTERN ANALYSIS OF CLEAR LAKE PHYTOPLANKTON,
California Univ., Berkeley Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5C.
W79-02227

SEASONAL CHANGES IN THE EPIPHYTE COMMUNITY OF NATURAL AND ARTIFICIAL MACROPHYTES IN LAKE MEMPHREMAGOG (QUE. AND VT.),
McGill Univ. (Montreal). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02232

RELEASE OF DISSOLVED ORGANIC CARBON BY GRAZING ZOOPLANKTON,
Frankfurt Univ. (West Germany). Fachbereich Biologie.
For primary bibliographic entry see Field 5C.
W79-02234

AN EVALUATION OF PHOSPHORUS-CHLOROPHYLL-PHYTOPLANKTON RELATIONSHIPS OF LAKES,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W79-02247

MAXIMUM DEPTH INHABITED BY AQUATIC VASCULAR PLANTS,
Rensselaer Polytechnic Inst. Troy, NY. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02249

RECENT CHANGES IN PLANKTON COMMUNITIES AND PRESENT TROPHIC STATE OF LAKE STEINSFJORD,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W79-02250

HYDROLOGIC BUDGET MODEL,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands
F. C. Wang, and K. Heimburg.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 68-109, 1976. 17 fig, 15 tab.

Descriptors: *Swamps, *Model studies, *Hydrologic budget, *Wetlands, Hydrologic properties, Mathematical models, Water balance, Water table, Florida.

An equation is derived relating the water depth changes in cypress domes to the water budget components of the ecosystem. In this equation, all waters, surface and subsurface, entering or leaving a dome are included. The changes of dome water level exhibit the dynamics of surface and subsurface flows. The dome water level at the end of each month is taken as the sum of the previous month's water level and the water level change predicted for the equation during the month. The model has been calibrated for two different years and for three different domes. The water components are not exactly balanced, but are within the limit of accuracy of the collected data. (See also W79-02256) (Steiner-Mass)
W79-02258

STRATIGRAPHY AND HYDROGEOLOGIC CORRELATION STUDIES IN SEVERAL CYPRESS DOMES-NORTH CENTRAL FLORIDA,
Florida University, Gainesville, Department of Geology
For primary bibliographic entry see Field 5E.
W79-02259

HYDROLOGY OF THE AUSTIN CARY CONTROL DOME,
Florida Univ., Gainesville. Dept. of Geology; and Florida Univ., Gainesville, FL. Center for Wetlands.
For primary bibliographic entry see Field 5E
W79-02260

RADIATION STUDIES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands
For primary bibliographic entry see Field 2I
W79-02261

SEASONAL CHANGES IN THE DISTRIBUTION OF WATER FERN AND DUCKWEED IN CYPRESS DOMES RECEIVING SEWAGE,
Florida Univ., Gainesville, School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02262

UPTAKE AND DISTRIBUTION OF PHOSPHORUS IN THE UNDERSTORY OF CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02264

LITTERFALL AND LITTER DECOMPOSITION IN FOUR CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02265

AIR EMISSIONS FROM CYPRESS SWAMPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02266

THE RESPONSE OF BENTHIC INVERTEBRATE POPULATIONS TO SEWAGE ADDITION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02267

COLIFORM MONITORING OF WATERS ASSOCIATED WITH THE CYPRESS DOME PROJECT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W79-02268

WATER QUALITY OF CYPRESS DOMES: ROUTINE SAMPLING PROGRAM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Scientific; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02269

DENITRIFICATION AND SURFACE RUNOFF IN THE EXPERIMENTAL DOMES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Centre for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02270

RATES OF GROWTH AND NUTRIENT CONCENTRATIONS OF TREES IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-02271

GROWTH RATES OF SEEDLINGS PLANTED IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02272

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON GROWTH OF SURROUNDING PINE SEEDLINGS AND TREES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02274

SEDIMENTATION RATES: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W79-02275

NITROGEN TRANSFORMATIONS IN WATER AND SEDIMENTS OF CYPRESS DOMES WITH AND WITHOUT ADDED SEWAGE EFFLUENT,
Florida Univ., Gainesville. Dept. of Soil Science.
J. E. Struble, and D. A. Graetz.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 517-539, 1976. 11 fig, 3 tab, 7 ref.

Descriptors: *Swamps, *Water pollution effects, *Denitrification, Wetlands, Florida, Waste water disposal, Sewage, Nutrients, Nitrogen, Nitrates, Groundwater, Ammonia, Percolation.

The NH4-N and NO3-N levels entering cypress domes receiving sewage effluent was in the range of 4 and 10 ppm N, respectively, while the water entering another dome receiving groundwater had less than 1 ppm NH4-N or NO3-N. The NH4 and NO3 may be taken up by the vegetation of the dome. Part of the NO3 that is present in the water may diffuse into the sediment layer. Once in contact with the active layer of sediment, the NO3 may be converted to N20 or N2 gas through denitrification reactions. The denitrification reactions in the sediments are important for the removal of NO3 entering the groundwater. As water percolates, the NH4 remaining in the water may be absorbed to the cation exchange sites on the organic matter in the sediments. But as these sites reach maximum adsorption, the excess NH4 may percolate through the dome. (See also W79-02256)(Steiner-Mass)
W79-02276

COMPARATIVE STUDIES OF CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environemental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
S. Brown.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 540-560, 1976. 8 fig, 5 tab.

Descriptors: *Swamps, *Productivity, *Photosynthesis, Nutrients, Fertilization, Florida, Respiration.

Measurements of photosynthesis, respiration, and litterfall of cypress dome ecosystems were made to determine what effects the hydrologic and nutrient cycles have on these systems' productivity. The results are presented for each and the domes measured and a few comparisons are made. The data indicates that increased fertility produces increased productivity in cypress domes. (See also W79-02256)(Steiner-Mass)
W79-02277

DISTRIBUTION OF CHLOROPHYLL IN CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02278

THE EFFECTS OF PERTURBATION ON CYPRESS DOME ANIMAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02279

COMPARISON OF FALL BIRDS PRESENT IN A NATURAL CYPRESS DOME, AND THE ADJACENT PINE PLANTATION,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02280

PROGRESS REPOT ON MOSQUITOE RESEARCH: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Entomology and Nematology; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5G.
W79-02281

ECOSYSTEM ANALYSES AT CORKSCREW SWAMP,
National Audubon Society, New York.
For primary bibliographic entry see Field 2I.
W79-02282

ACCELERATING SECONDARY SUCCESSION IN CYPRESS STRANDS,
Florida Univ., Gainesville. Dept. of Botany; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02283

THE ORGANIC SEDIMENTS OF CORKSCREW SWAMP SANCTUARY,
Central and Southern Florida Flood Control District, West Palm Beach, FL.
P. A. Stone, and P. J. Gleason.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 763-771, 1976. 2 tab, 6 ref.

Descriptors: *Swamps, *Peat, *Cores, Wetlands, Florida, Marshes, Nitrogen, Oxygen, Muck soils.

The deposit of organic sediment, principally peat, found at Corkscrew Swamp Sanctuary is occupied by two dissimilar plant communities, an open marsh consisting of graminoid vegetation and a mature cypress swamp dominated by large bald cypress trees. Compared to Everglades peat, Corkscrew Swamp peats are more degraded with less plant material retaining indentifiable tissue structure which is indicative of a poorer preserving environment, possibly a shorter hypoperiod, or deeper zone of aeration. On a moisture-free basis, nitrogen decreases with depth. Oxygen decreases and sulfur increases with depth, except for the bottom sample. The bottom sample may represent a different parent material (plant community) or differing preserving environment, for it is adjacent to calcareous sediments. (See also W79-02256) (Steiner-Mass)
W79-02284

DISSOLVED HYDROGEN SULFIDE IN SOIL WATER IN SAN FELASCO HAMMOCK AND DEERHAVEN CYPRESS DOME,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5B.
W79-02285

CYPRESS GROWTH RESPONSE IN A SEWAGE-ENRICHED POND CYPRESS ECOSYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02287

A PALEOLIMNOLOGICAL COMPARISON OF BURNTSIDE AND SHAGAWA LAKES, NORTHEASTERN MINNESOTA,
Geological Survey, Denver, CO.
For primary bibliographic entry see Field 5C.
W79-02295

IDENTIFICATION AND DELINEATION OF FRESHWATER WETLAND VALUES,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6B.
W79-02402

THE RELEASE OF PLANT NUTRIENTS FROM REED BORDERS AND ITS TRANSPORT INTO THE OPEN WATERS OF THE BODENSEE-UNTERSEE, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W79-02422

INVESTIGATION OF THE MICROFLORA OF SWAMP ORE AND LAKE WATER BY THE METHOD OF ELECTRON MICROSCOPY, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W79-02423

THE EFFECT OF DRAWDOWN DATE ON WETLAND PLANT SUCCESSION,
Winous Point Club, Port Clinton, Ohio.
For primary bibliographic entry see Field 2I.
W79-02424

THE VEGETATION OF SOUTHERN FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-02425

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ONTARIO,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5C.
W79-02428

ORGANOCHLORINE AND MERCURY RESIDUES IN FISH FROM LAKE SIMCOE, ONTARIO 1970-76,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
For primary bibliographic entry see Field 5B.
W79-02456

THE CRUSTACEAN ZOOPLANKTON OF GRASMERE BEFORE AND AFTER A CHANGE IN SEWAGE EFFLUENT TREATMENT,
Freshwater Biological Association, Ambleside, (England).
For primary bibliographic entry see Field 5C.
W79-02458

2I. Water In Plants

THE NATURE OF GROWTH FORMS IN THE SALT MARSH GRASS SPARTINA ALTERNIFLORA,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 2L.
W79-02087

DO TIDES AFFECT COASTAL INSECT COMMUNITIES,
Houston Univ., TX. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W79-02089

VEGETATION CHANGES IN A SMALL MICHIGAN BOG FROM 1917 TO 1972,
Michigan Univ., Pellston. Biological Station.
For primary bibliographic entry see Field 2H.
W79-02091

THE DISTRIBUTION OF JUNCUS ROEMERIANUS IN THE SALT MARSHES OF NORTH AMERICA,
Gulf Coast Research Lab., Ocean Springs, MS
For primary bibliographic entry see Field 2L.
W79-02093

AQUATIC INVERTEBRATE ABUNDANCE IN RELATION TO CHANGING MARSH VEGETATION,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 2H.
W79-02095

GEOGRAPHIC VARIATIONS IN SALT MARSH MACROPHYTE PRODUCTIONS: A REVIEW,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 2H.
W79-02098

ROOT PRODUCTION AND ROOT TURNOVER IN A WET TUNDRA ECOSYSTEM, BARROW, ALASKA,
Duke Univ., Durham, NC. Dept. of Botany.
G. R. Sharer, and W. D. Billings.
Ecology, Vol. 56, No. 2, p 401-409, Early Spring, 1975. 8 fig, 4 tab, 22 ref.

Descriptors: *Root systems, *Primary productivity, *Tundra, *Turnovers, Ecosystems, *Alaska, Wetlands, Seasonal, Biomass, Root distribution, Tiller systems.

The wet tundra near Barrow, Alaska, is dominated by three species of graminoids: Dupontia fischeri, Carex aquatilis, and Eriophorum angustifolium Root production, turnover, and distribution patterns were studied by direct observation of growing roots and by analysis of whole, interconnected tiller systems dug from the soil. Root weight per unit length and density of individual tillers were also measured in the field. Production of new roots was found to be strongly correlated with age of individual tillers, each species having a distinctive growth pattern and phenology. Root turnover rates varied considerably ranging from an annual turnover in E. angustifolium to 6-8 or possibly 10 years in C. aquatilis. An estimate of root turnover on an ecosystem basis is about 100 g/sq m/yr, or 25% of the live root biomass. Species with the shallowest and longest lived roots have the greatest weight per unit length of root, and vicer versa. Each species has a characteristic root distribution pattern with depth and in relation to the progress of soil thaw. (Stihler-Mass)
W79-02100

BIOCHEMICAL AND TRANSPIRATION STUDIES OF THE GROWTH FORM OF SPARTINA ALTERNIFLORA ON CONNECTICUT SALT MARSHES,
Connecticut Coll., New London. Dept. of Botany.
M. L. Shea, R. S. Warren, and W. A. Niering.
Ecology, Vol. 56, No. 2, p 461-466, Early Spring, 1975. 8 fig, 18 ref.

Descriptors: *Rooted aquatic plants, *Adaptation, *Plant morphology, *Salt marshes, *Connecticut, Coastal marshes, Ecotypes, Intertidal areas, Environmental effects, Plant growth, *Spartina alterniflora.

In southern New England Spartina alterniflora occurs as a tall grass (1.25-2 m) within the intertidal zone and as a short form (0.3-0.4 m) within pannes on the high marsh. By means of electrophoretic comparisons of total soluble proteins and selected enzymes, along with reciprocal field transplants, an attempt was made to clarify the ecotype versus ecophene status of these different forms. All data obtained suggest that the tall and short forms are genetically indistinguishable and therefore merely reflect physiological responses to the environmental differences between the inter-tidal and panne sites
W79-02101

THE AUTECOLOGY OF SAWGRASS IN THE FLORIDA EVERGLADES,
Agricultural Research Service, Fort Lauderdale, FL. Southern Region.
For primary bibliographic entry see Field 2L.
W79-02104

ANGIOSPERM PRODUCTION OF THREE VIRGINIA MARSHES IN VARIOUS SALINITY AND SOIL NUTRIENT REGIMES,
Virginia Inst. of Marine Science, Gloucester Point, VA.
For primary bibliographic entry see Field 2L.
W79-02108

AN ATLAS OF VASCULAR PLANT SPECIES DISTRIBUTION MAPS FOR TIDEWATER MARYLAND,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
W. S. Sipple
Wetland Publication No. 1, April, 1978. 280 p, 231 fig, 24 ref, 1 append.

Descriptors: *Marsh plants, *Mapping, *Distribution patterns, *Maryland, Wetlands, Coastal marshes, Tidal marshes, Salt marshes, Marshes, Swamps, *Maps.

The locations of 238 species of strand, submerged aquatic, and tidal wetland vascular plants are mapped along the Maryland coast. Species distribution maps are divided into three general categories: strand, marsh, and swamp plants. Strand plants include those that are usually found on beaches, dunes, spits, overwash berms, and similar habitats. Marsh plants are divided further into freshwater and brackish marsh groups and the swamp types into shrub swamp and swamp forest groups. (Steiner-Mass)
W79-02109

A REVIEW OF THE BIOLOGY, ECOLOGY, AND MANAGEMENT OF SCIRPUS OLNEYI, VOLUME I: AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
W. S. Sipple
Wetland Publication No. 2, May, 1978. 96 p, 180 ref

Descriptors: *Bibliographies, *Bulrushes, Abstracts, Marsh plants, Rooted aquatic plants, Monocots, Reviews.

A bibliography of 158 annotated and 22 additional, non-annotated references are listed and indexed The key word/phase index contains 192 key words listed under 13 categories: anatomy, distribution, ecology, genetics, growth and development, impact of or use by, management, morphology, ontogeny, physiology or chemical composition, reproduction, soil, and taxonomy. (Steiner-Mass)
W79-02110

A BIBLIOGRAPHY OF MARYLAND'S TIDAL WETLANDS (MARSHES-SWAMPS),
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2L.
W79-02111

APPARENT USE OF SEDIMENT NITROGEN AND PHORPHORUS BY PLANTS IN MALLETTS CREEK MARSH WITH IMPLICA-

TIONS TO LAKE CHAMPLAIN WATER LEVEL REGULATION,
Geological Survey, Albany, NY.
For primary bibliographic entry see Field 2H.
W79-02115

SIMULATED FLOW THROUGH THE ROOT XYLEM,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
W. J. Busscher, and D. D. Fritton.
Soil Science, Vol. 125, No. 1, p 1-6, January, 1978. 5 fig, 14 ref. 5 eau.

Descriptors: *Xylem, *Root systems, *Flow resistance, Flow rates, *Simulation analysis, Model studies, Water pressure, Evapotranspiration.

Flow through the xylem of a complex root system is simulated to measure xylem resistance to water flow, and to determine whether or not this resistance is significant. Equations are set up that model xylem water flow as if it were flow through thin tubes. The root characteristics needed to solve these equations are obtained from an earlier work. Xylem water flow is first considered for a single main root and its laterals. It decreases with age of the root or increase of root length, and it increases with the addition of laterals. The advantage of an increasing number of main roots is also shown. Finally, flow through the plant crown is compared to Thornthwaite and Blaney-Criddle evapotranspirational estimates. Less than 10 millibars of water pressure is needed to overcome xylem resistance, and, therefore, the resistance is considered negligible. (Skogerboe-Colorado State)
W79-02199

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
H. T. Odum, K. C. Ewel, J. W. Ordway, and M. K. Johnston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 097, Price codes: A99 in paper copy, A01 in microfidhe. Report NSF/RA-760508, 1976. 879 p.

Descriptors: *Swamps, *Nutrients, *Productivity, *Model studies, Wetlands, Florida, Sewage, Cycling nutrients, Bacteria, Marsh plants, Mosquitoes, Marsh management, Forest management, Invertebrates.

Studies of water budget and geology show how cypress domes store and save water compared to reservoirs. Experiments with recycling treated sewage water show that the cypress basins (domes) filter nutrients, microbes, heavy metals, and virus, improving the water as the sewage water recharges groundwater. Measurements and systems models show budgets of phosphorus, nitrogen, and carbon, and the role of trees, shrubs, sediments, duckweed, and sedimentation in processing materials, productivity, total metabolism, and building ecological patterns. Comparisons are made with strands and floodplains. Regional studies consider the quantitative role of swamps in water and nutrient budgets of four counties and the south Florida region. Detailed studies include measurements of encephalitus virus and mosquitoes, indices of insect abundance, chlorophyll, seedlings, litter, decomposition rates and soil characteristics. Engineering costs for swamps to serve in place of tertiary treatment are low. The report includes results of 14 phases, a report of the Center for Wetlands and auxiliary projects, report of a workshop, report on these, and publications, and summaries. (See W79-02257 thru W79-02287) (Steiner-Mass)
W79-02256

RADIATION STUDIES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands
K. Heimburg.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 157-162, 1976. 1 fig, 1 tab, 2 ref.

Descriptors: *Swamps, *Light penetration, *Climates, Wetlands, Light intensity, Aquatic environment, Light.

Spectral measurements show that cypress canopy does not significantly change the quality of sunlight reaching the bottom of the dome from that incident at the top; it just reduces its itensity. Too few measurements of the reflection spectrum have been made to allow identification of a characteristic cypress spectrum or comparison to reflection spectra of other vegetation types. Meteorologic data indicate that climate inside the domes is ameliorated substantially by the presence of water vapor; during the day it is slightly cooler in the dome than outside it, and the reverse is true at night. The fluctuations in water temperature are much smaller in a duckweed covered dome, an environmental factor that may be important to decomposition processes taking place in the water. (See also W79-02256) (Steiner-Mass)
W79-02261

SEASONAL CHANGES IN THE DISTRIBUTION OF WATER FERN AND DUCKWEED IN CYPRESS DOMES RECEIVING SEWAGE,
Florida Univ., Gainesville, School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
K. C. Ewel.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville p. 164-170, 1976. 2 fig, 1 tab, 2 ref.

Descriptors: *Swamps, *Floating plant, *Ferns, *Annual succession, Wetlands, Florida, Aquatic plants, Marsh plants, Distribution patterns, Cycling nutrients.

During the spring, summer, and fall, the nonrooted, floating plant cover in two cypress domes which had been receiving secondarily treated sewage consisted almost entirely of two duckweed species, Lemna perpusilla and Spirodela aligorhiza. Small patches of Azolla caroliniana, a small floating water fern, was also found, usually associated with a patch of emergent vegetation. There were no floating plants on the surface of the central area of a cypress dome which has had groundwater pumped into it weekly, although both Lemna and Azolla are common around the edge. Only Lemna and Spirodela are found on the undisturbed dome. During the winter, Azolla increased its percentage of coverage in both domes significantly. This change may be due primarily to a change in light intensity. Considering both the nitrogen-fixing ability of Azolla and the dependence of Lemana on a nitrate source, the shift in species composition may clearly hve important consequence on the nutrient cycling role played by the plants. (See also W79-02256) (Steiner-Mass)
W79-02262

CHANGES IN UNDERSTORY VEGETATION IN CYPRESS DOMES BROUGHT ABOUT BY FIRE AND ADDITION OF SEWAGE,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02263

UPTAKE AND DISTRIBUTION OF PHOSPHORUS IN THE UNDERSTORY OF CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02264

LITTERFALL AND LITTER DECOMPOSITION IN FOUR CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
G. Deghi.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 197-231, 1976. 15 fig, 3 tab, 1 ref.

Descriptors: *Swamps, *Leaves, *Productivity, Wetlands, Florida, Burning, Canopy, Deciduous trees, Trees.

In two unburned cypress domes, the fastest litterfall rate occurred in November while the peak was delayed until December in two burned domes. Hardwood litterfall peaks occur prior to the peaks of cypress needles, and the earlier peaks of total litterfall in the two unburned domes are presumably due to the lack of hardwoods, primarily blakgum, in the canopy of the burned domes. Large wood accounts for a much larger percentage of the annual litterfall in the burned domes. Because of the fire, there is much dead above-ground organic matter which blows over in the winter when high winds accompany frontal storms. The cumulative total litterfall was 199 and 480 g/sq m/ year for the unburned domes. Large increases in normal litterfall were exhibited by the two burned domes in the second year of the study, 461 and 811 g/sq m/year, respectively. This increase suggests recovery from burning. Little change in tree diameters has been reported in most of the domes; thus, productivity is manifested in litterfall and the cumulative annual litterfall may provide an estimate of net production. (See also W79-02256) (Steiner-Mass)
W79-02265

AIR EMISSIONS FROM CYPRESS SWAMPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02266

THE RESPONSE OF BENTHIC INVERTEBRATE POPULATIONS TO SEWAGE ADDITION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02267

RATES OF GROWTH AND NUTRIENT CONCENTRATIONS OF TREES IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-02271

GROWTH RATES OF SEEDLINGS PLANTED IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02272

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON SURROUNDING SOIL MOISTURE AND NUTRIENT CONTENT AND ON GROWTH OF PINE TREES (SUMMARY OF MS THESIS),
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02273

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON GROWTH OF SURROUNDING PINE SEEDLINGS AND TREES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02274

COMPARATIVE STUDIES OF CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environemental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2H.
W79-02277

DISTRIBUTION OF CHLOROPHYLL IN CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
S. Brown, and J. Truelson.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 561-576, 1976. 3 fig, 3 tab, 5 ref.

Descriptors: *Swamps, *Florida, *Chlorophyll, Wetlands, Plant pigments, Trees, Photosynthesis, Plant physiology.

In most of the cypress leaves measured, especially those in the top canopy levels, the chlorophyll a content was two to three times the maximum range level of most plants. The results expressed on a mg chlorophyll/g of leaf dry weight show that in general the lower down in the forest canopy the leaves, the greater the concentration of chlorophyll a. This may represent shade adaptation in the leaves in response to lower light levels. The chlorophyll a to b ratio was 1-1.5 for the cypress leaves compared to a normal ratio of 2-3 for most plants. The less fertile cypress domes showed fewer chlorophyll differences than the more fertile sites. (See also W79-02256)(Steiner-Mass)
W79-02278

COMPARISON OF FALL BIRDS PRESENT IN A NATURAL CYPRESS DOME, AND THE ADJACENT PINE PLANTATION,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02280

PROGRESS REPOT ON MOSQUITOE RESEARCH: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Entomology and Nematology; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5G.
W79-02281

ECOSYSTEM ANALYSES AT CORKSCREW SWAMP,
National Audubon Society, New York.
M. J. Duever, J. E. Carlson, L. A. Riopelle, L. H. Gunderson, and L. C. Duever.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 707-737, 1976. 9 fig, 5 tab, 4 ref.

Descriptors: *Swamps, *Florida, *Regional analysis, Wetlands, Freshwater marshes, Productivity, Soils, Vegetation, Grazing.

A report is given on the progress of field work being done on the Corkscrew Swamp Sanctuary, Florida. Factors being measured include the soil, watershed, marsh productivity, cypress biomass and DBH, cypress bole production, vegetation types, and the effects of cattle grazing. (See also W79-02256) (Steiner-Mass)
W79-02282

ACCELERATING SECONDARY SUCCESSION IN CYPRESS STRANDS,
Florida Univ., Gainesville. Dept. of Botany; and Florida Univ., Gainesville. Center for Wetlands.
L. Gunderson.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 738-762, 1976. 2 fig, 10 tab, 7 ref, 1 append.

Descriptors: *Swamps, *Vegetation regrowth, *Forest management, Wetlands, Florida, Trees, Revegetation, Lumbering, Burning, Seeds, Germination.

Seeds and seedlings of cypress were planted into seral stages following logging, burning, and logging-and-burning, to test the successional stage at which cypress invades most successfully. Of the seedlings transplanted, 78% survived. No difference in seedling mortality among sites was noticed. Survival of seedlings in cleaned areas was not different from that of seedlings growing among the existing vegetation. Average seed germination was less than 3% at all sites. The critical factors in cypress regeneration seem to be available seed source and proper water requirements for germination and survival. Once seed sources are removed, regrowth can be slow. Cypress regrowth may be slower than other logged forests due to limited mobility of the seeds. A few seed sources were present at the logged and the burned sites. Regeneration is occurring at these sites and is probably retarded by the moisture requirements. No cypress regeneration was noticed at the logged-and-burned site. (See also W79-02256) (Steiner-Mass)
W79-02283

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W79-02389

EARTHQUAKE-INITIATED CHANGES IN THE NESTING HABITAT OF THE DUSKY CANADA GOOSE,
Rutgers - The State Univ., Newark, NJ. Dept. of Botany.
J. H. Crow
The Great Alaska Earthquake of 1964: Biology. National Academy of Sciences, Washington, D.C 1971. p 130-136. 3 fig, 2 tab, 12 ref.

Descriptors: *Alaska, *Marsh plants, *Distribution patterns, *Earthquakes, *Canada goose, *Nesting cover, Wetlands, Salt marshes, Grasses, Marshes, Coastal marshes, Waterfowl, Wildlife habitat

The dusky Canada goose nests in a restricted part of the Copper River delta occupied by a plant community characterized by Hedysarum alpinum americanum and Deschampsia beringensis. This vegetation flourishes in the slightly saline soils at the tops of channel banks, where before the earthquake it was inundated by diluted seawater during occasional storm tides. As a result of uplift during the earthquake, however, the pre-earthquake channel-bank vegetation and the interchannel areas are no longer reached by even the highest tides, and the soil is being rapidly desalinized. Drier conditions and the removal of salt permit invasion of the Hedysarum-Deschampsia belt by plants characteristic of other belts, and hence the favored nesting habitat of the goose is deteriorating. Presumably the Hedysarum-Deschampsia community will eventually reestablish itself at a lower level on the tidal flats, but the area available is expected to be smaller than the area occupied at present. Over the years the dusky Canada goose will find progressively more restricted nesting grounds, which will lead to a reduction in its numbers unless it can adapt to other kinds of vegetation. (Steiner-Mass)
W79-02416

DIURNAL USE OF SMALL WETLANDS BY DUCKS,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
A. T. Klett, and L. M. Kirsch.
Journal of Wildlife Management, Vol 40, No 2, p 351-353, April, 1976. 1 tab, 11 ref.

Descriptors: *Ducks, *Blue-winged teal, *Wetlands, *North Dakota, Habitats, Waterfowl, Ponds, Diurnal.

In 1969 morning and afternoon counts of ducks using 43 small wetlands in east-central North Dakota were made; in 1970 morning, afternoon, and evening counts were made. These wetlands were typically shallow and devoid of emergent cover except for a narrow marginal band. Peak use by Blue-winged Teal occurred in the early morning and evening especially during the period when most birds were observed as segregated pairs. Observations of species other than Blue-winged Teal were too few to determine changes in the use of these wetlands. (Stihler-Mass)
W79-02418

PRODUCTION OF SUBMERGED AQUATIC PLANT COMMUNITIES OF DOODHADHARI LAKE RAIPUR, (M. P. INDIA),
Government Post Graduate Coll., Chhindware (India). Dept. of Botany.
K S Unni
Hydrobiologia, Vol. 48, No. 2, p 175-177, February 29, 1976. 2 tab, 16 ref.

Descriptors: *Primary productivity, *Submerged plants, *Lakes, Wetlands, Aquatic plants, Rooted aquatic plants, Biomass, Doodhadhari Lake(India)

The biomass of submerged aquatic plant communities was studied periodically during the two annual growth periods of one year. Najas minor contributed 78% to the total standing biomass. Ceratophyllum dermersum, Hydrilla spp., Nelumbo nucifera, Trapa bispinosa, and Potamogeton crispus contributed towards the remaining biomass. Production, as calculated by the difference between initial and final biomass, was 0.64 g/sq m/day for the growing seasons. (Stihler-Mass)
W79-02419

AQUATIC VASCULAR PLANTS OF LAKE APOPKA, FLORIDA,
Georgia Coll., Nilledgeville. Inst. of Natural Resources.
T. L. Chesnut, and E. H. Barman, Jr.
Florida Scientist, Vol. 37, No. 1, p 60-64, Winter, 1974. 1 tab, 7 ref.

Descriptors: *Aquatic plants, *Florida, *Lakes, *Lake Apopka(Fla), Rooted aquatic plants, Floating plants, Submerged plants, Algae, Water hyacinths, Eutrophication, Wetlands.

Emergent plants are abundant around most of Lake Apopka's perimeter. Water hyacinth, the most common plant present, has increased in abundance since the vegetation was surveyed in the early 1960's. Massive algal blooms, resulting from advanced eutrophication, have shaded out bottom dwelling plants. (Stihler-Mass)
W79-02420

THE EFFECT OF DRAWDOWN DATE ON WETLAND PLANT SUCCESSION,
Winous Point Club, Port Clinton, Ohio.
R. L. Meeks.
Journal of Wildlife Management, Vol. 33(4), p 817-821, October, 1969. 1 tab, 8 ref.

Descriptors: *Marsh plants, *Succession, *Drawdown, Wetlands, Wildlife habitats, Ohio, Freshwater marshes, Marshes, Water levels.

An 80-acre marsh was diked into four units, one of which was drained yearly in mid-March, one in mid-April, and one in mid-May, and one in mid-June. All of the units were reflooded during September. Plant succession followed the same general trend on all units, going from semi-aquatic species to predominantly annual weeds. Fewer years were required with early drawdowns for annual weeds to replace semi-aquatic species. The May drawdown unit had the best plant associations for wildlife after seven seasons. (Steiner-Mass)
W79-02424

THE VEGETATION OF SOUTHERN FLORIDA,
University of South Florida, Tampa. Dept. of Biol-

gy.
. W. Long.
lorida Scientist, Vol. 37, No. 1, p 33-45, Winter 974. 6 fig, 1 tab, 19 ref.

Descriptors: *Florida, *Vegetation, *Plant popula-ions, Aquatic plants, Wetlands, Mangroves, Marshes, Salt marshes, Rivers, Marine plants, Dunes, Pine trees, The Everglades, Big Cypress Swamp, Atlantic Coastal Ridge.

Five physiographic provinces are recognized for his area: Sandy Flatwoods, the Everglades, Big Cypress Swamp, the Atlantic Coastal Ridge, and he Coastal Marshes and Mangrove Swamps. Prin-ipal plant associations in southern Florida are: Scrub Vegetation, Hardwood Hammocks occur-ing in the Everglades, Fresh Water Swamps looded by shallow water throughout most of the ear, Dry Pineland, Wet Pineland occurring on easonally flooded low areas, Mangroves, Salt Marsh, Wet Prairies dominated by Saw Grass, Dry Prairies, Coastal Strand, Ruderal, Aquatic and Marsh Communities, and Marine Communities in-cluding dense submarine meadows. There are 1647 species of vascular plants in this area; 60.6% are of ropical origin. Approximately 10% of the total lora are endemic, and most of these appear to be elated to the temperate Appalachian flora. (Stihler-Mass)
W79-02425

PHYSIOLOGICAL ASPECTS OF WATER USE EFFICIENCY,
Nebraska Univ., Lincoln. Dept. of Agronomy.
C. Y. Sullivan, J. D. Easton, J. M. Bennett, and N. V. Norcio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 344, Price codes: A04 in paper copy, A01 in microfiche. Nebraska Water Resources Center, The University of Nebraska, Project Completion Report, 1978. 57 p, 6 fig, 3 tab, 11 ref. OWRT A-044-NEB(1). 14-34-0001-8029.

Descriptors: *Water use efficiency, *Sorghum, *Water stress, *Water utilization, Drought tolerance, *Photosynthesis, Root systems, Leaves, Osmotic pressure, Turgor potential, *Plant physiology.

Grain sorghum plants growing in hydroponic cultures in a greenhouse were subjected to various levels of water stress by the addition of polyethylene glycol to the nutrient solutions. Several physiological parameters, including net photosynthesis, leaf diffusive resistance, leaf water, osmotic and turgor potentials were measured before, during and after the stress periods. In addition, total grain yield, number of seeds per plant, total dry weight, plant height, stover weight, root weight and length, and water use efficiency were determined for each treatment. Plant conditioning or hardening to drought stress was examined by monitoring photosynthesis of plants which had previously been exposed to a preconditioning stress. It was concluded that plants which had been subjected to a preconditioning stress could better withstand and recover from a later more severe water deficit. This conditioning response is probably a result of both physical and biochemical changes which occur within the plant. The conditioning response was also dependent on genotype. In other experiments it was shown that sorghums could grow well with only a small portion of their total root systems in contact with nutrient water. It is suggested that selection for sorghum genotypes with a few penetrating roots with high water absorption capacity would increase water use efficiency.
W79-02449

2J. Erosion and Sedimentation

GRADIENT, DISCHARGE, AND PARTICLE-SIZE RELATIONS OF ALLUVIAL CHANNELS IN KANSAS, WITH OBSERVATIONS ON BRAIDING,
Geological Survey, Lawrence, KS. Water Resources Div.
W. R. Osterkamp.
American Journal of Science, Vol 278, p 1253-1268, November 1978. 5 fig, 3 tab, 16 ref.

Descriptors: *Gradients(Streams), *Alluvial channels, *Average flow, *Bottom sediments, *Particle size, *Kansas, Streams, Sediment transport, Meanders, Braiding, Beds, Bed material, Power-function equations.

Gradient, mean-discharge, and bed-material-size data were compiled for 76 alluvial streams of Kansas. A series of functional analyses of the data demonstrates that groupings based on median particle size and sorting of bed material are better than groupings based on channel pattern or sinuosity. Data collected suggest that particle sizes of bed material affect braided channels in a similar manner as for nonbraided streams. Consideration of conditions conductive to braiding indicate the possibility that lower limits for gradient can be defined for braided streams of specified mean-discharge and bed-material characteristics. (Woodard-USGS)
W79-02120

SEDIMENTATION IN HOT CREEK IN VICINITY OF HOT CREEK FISH HATCHERY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
D. E. Burkham.
Available from OFSS Branch of Distribution USGS, Box 25425, Fed. Ctr., Denver, CO. 80225; Microfiche $4.00, Paper copy $1.75. Open-file report 78-661, August 1978. 9 p, 1 fig, 9 ref.

Descriptors: *Sedimentation, *Fluvial sediments, *Streams, *Environmental effects, *Trout, Sediment transport, *California, Mono County(CA), *Hot Creek.

An accumulation of fine-grained sediment in Hot Creek downstream from Hot Creek Fish Hatchery, Mono County, Calif., created concern that the site may be deteriorating as a habitat for trout. The accumulation is a phenomenon that probably occurs naturally in the problem reach. Fluctuation in the weather probably is the basic cause of the deposition of fine-grained sediment that has occurred since about 1970. Man's activities and the Hot Creek Fish Hatchery may have contributed to the problem; the significance of these factors, however, probably was magnified because of drought conditions in 1975-77. (Woodard-USGS)
W79-02128

A CONTRIBUTION TO THE LAKE PLEISTOCENE STRATIGRAPHY OF THE SUSQUEHANNA RIVER VALLEY OF NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
A. D. Randall.
Empire State Geogram, Vol 14, No 2, p 1-15, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: *Stratigraphy, *Sediment transport, *Particle size, *Geologic formations, River basins, Valleys, Glaciers, Ice, Melt water, Geologic history, Evaluation, *New York, *Susquehanna River basin(NY), *Late Pleistocene, *Stratified drift.

Local variations in erratic-pebble content of stratified drift in parts of the Susquehanna River basin in New York are comparable in magnitude to regional variations described in the literature. Along the Susquehanna valley west of Binghamton, older stratified drift in any locality contains very few erratic pebbles in comparison with younger deposits. Extensive terraces are capped by 'bright' gravel, in which 30 to 50 percent of the pebbles are of erratic lithologies; the terraces are underlain and locally bordered by 'drab' gravel and sand in which 85 to nearly 100 percent of the pebbles consist of local shale and siltstone. Any till beneath the stratified drift is drab. These relationships are useful in local subsurface correlation. The stratified drift was deposited during a single deglaciation in which melt-water streams probably extended a few tens of miles through stagnant and active ice; these streams may have played a major role in transporting erratic material southward. (Woodard-USGS)
W79-02135

DISTRIBUTION OF SURFICIAL SEDIMENTS AND EELGRASS IN NEW YORK'S SOUTH SHORE BAYS: AN ASSESSMENT FROM THE LITERATURE,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W79-02162

TRANSPORTATION AND ACCUMULATION OF FINE-GRAINED SEDIMENTS IN THE ESTUARINE ENVIRONMENT: RECOMMENDATIONS FOR RESEARCH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W79-02165

SUBSURFACE GEOLOGICAL INVESTIGATION OF A PLEISTOCENE BRAIDED STREAM IN THE NORTHERN COASTAL PLAIN, DELAWARE (U.S.A.),
Delaware Geological Survey, Newark.
N. Spoljaric.
Sedimentology, Vol. 21, p 451-461, 1974, 3 fig, 17 ref. OWRT B-002-DEL(4).

Descriptors: *Braiding, *Channel morphology, *Facies(Sedimentary), *Fluvial sediments, *Sedimentary structures, Texture, *Coastal plains, Fluvial depositional environments, Subsurface primary sedimentary structures, Textural sedimentary parameters, Northern Atlantic Coastal Plain, *Delaware.

Primary sedimentary structures and sedimentary textures of the Pleistocene fluvial sediments of the Columbia Formation were investigated both in the outcrops and in the subsurface. Unknown sedimentary structures were recognized in the subsurface by correlating some textural parameters (mean grain size, skewness, and kurtosis) of the drilling (subsurface) samples with those of the outcrop samples where the sedimentary structures were known. The utilization of both the sedimentary structures were known. The utilization of both the sedimentary structures and the textures made it possible to recognize major morphologic elements of a Pleistocene stream system (channels, channel bars, floodbasins, and channel-fills) in the subsurface and to reconstruct, in a general way, the events that occurred during the existence of the stream system. Although the technique of the recognition of primary sedimentary structures in the subsurface employed in this study has been useful in the interpretation of the fluvial sedimentary bodies, it needs further testing before it can be accepted as a new geologic tool.
W79-02167

TRACE ELEMENT OF THE SARDIS RESERVOIR, MISSISSIPPI, AS RELATED TO CLAY MINERAL DISPERSION,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2H.
W79-02187

STRUCTURAL CONTROL OF THE RAPIDS AND POOLS OF THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2E.
W79-02200

COMPUTATION OF THE CONCENTRATION OF SUBSTANCES IN RIVERS AND CANALS,
For primary bibliographic entry see Field 5B
W79-02206

MECHANISM OF FORMATION AND FORECAST OF THE DEVELOPMENT OF THE VOLGA DELTA,
R. I. Selivanov.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 55-60, 1977. 5 fig, 1 tab, 24 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 109, No. 1, p 47-55, 1977.

Descriptors: *Deltas, *Geomorphology, *Alluvial fans, *Forecasting, Rivers, Alluvial channels, Sedimentology, Erosion, On-site investigations, Surveys, Analysis, Sediments, Sediment discharge, Foreign research, Foreign countries, *USSR, *Volga River(USSR), *Caspian Sea.

The Volga delta is a very dynamic geomorphological formation. In the last 50-60 years, its active part has increased by approximately 1/3 of its initial size. Two major processes participate in the advance of the front edge of the Volga delta: sediment accumulation and changes in sea level. It was shown that the Volga delta will advance almost 5 km in 25 years under high-flow conditions, and its front edge will grow 9 km under moderate flow conditions. With runoff of 75% probability, which corresponds approximately to the present inflow into the sea, the delta will move 11 km. The Volga delta can be preserved in approximately its present state only if the Caspian Sea level remains stationary and flow is moderate. Redistribution of liquid runoff and sediment discharge in the delta will affect navigation conditions. Navigation will cease in many eastern arms if their channels are not deepened and cleaned. With a sharp advance of the delta by the year 2000, it will be necessary to increase the length of the Volga-Caspian Canal by no less than 40-50 km, and the volume of dredging work will increase. (Humphreys-ISWS)
W79-02210

THE DISTRIBUTION AND FORM OF PHOSPHORUS IN NORTH ATLANTIC OCEAN DEEP-SEA AND CONTINENTAL SLOPE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 5B.
W79-02230

SEDIMENTATION RATES; CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Soil Science
For primary bibliographic entry see Field 5C.
W79-02275

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 4D.
W79-02293

SHOALING CONDITIONS IN SAWYER BEND AND LOWER ENTRANCE TO CHAIN OF ROCKS CANAL, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-02354

SPLASH AND DISCONTINUOUS RUNOFF AS CREATORS OF FINE SANDY LAG DEPOSITS WITH KALAHARI SANDS,
J. Savat, and J. Poesen.
Catena, Vol 4, p 321-332, 1977. 6 fig, 27 ref.

Descriptors: *Sediment transport, *Impact(Rainfall), *Particle size, Rainfall-runoff relationships, Sands, Erosion, Channel erosion, Sedimentation rates, Slope stability, Silts, Laminar flow.

The sand-covered western border of the Kwango Plateau, belonging to the Kalahari system, was cut during the Quaternary by tributaries of the Zaire River running toward the sea. Sedimentation of these sands has since been the focus of several investigations aimed at determining the processes that alter grain size distribution. A study of the large convex dome-shaped hills found near the city of Kinshasa reveals that splash and discontinuous runoff are the dominant erosion processes shaping these hills. Typically, their sand cover becomes progressively finer downhill where the slope is steeper. For the present study, 33 samples were taken from four locations on the top and slopes of Amba Hill. Grain size parameters were measured. Only fine sand, silt, and clay below .214 mm were found on the downhill convex western slope. Laboratory simulation illustrated that splash alone was not responsible for this sorting as it leaves the coarsest sands (7.6 mm) behind on the hilltop. Disturbed laminar flow is found to accomplish this sorting since it affects all grains including those coarser than 1.0 mm. Very fine fractions were found to be protected to some extent by the formation of a filtration pavement. (Tickes-Arizona)
W79-02393

HYPERSALINE LAGOONAL DEPOSITS AND PROCESSES,
University of Southern California, Los Angeles. Dept. of Geological Science
For primary bibliographic entry see Field 2L.
W79-02430

HOLOCENE FAULTING IN THE WESTERN GRAND CANYON, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology.
P. W. Huntoon.
Geological Society of America Bulletin, Vol. 88, p. 1619-1622, November 1977. 4 fig, Doc. No. 71108. OWRT B-031-WYO(3), 14-34-0001-6134

Descriptors: *Structural geology, *Faults, Geologic formations, Displacements, Geomorphology, Arizona, *Holocene movement, *Western Grand Canyon(Ariz), Toroweap fault, Hurricane fault, Southwestern Colorado Plateau.

The Toroweap and Hurricane faults and a subsidiary fault in the western Grand Canyon exhibit evidence of Holocene movement. This evidence includes scarps in alluvium and sediments ponded against a fault on the downthrown block. These displacements are the latest in a well-exposed record of recurrent movements along the major faults in the region.
W79-02496

2K. Chemical Processes

ATMOSPHERIC FORMATION, DISPERSION, AND DEPOSITION OF ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W79-02015

THE ORIGIN OF LABYRINTH AND TOWER KARST AND THE CLIMATIC CONDITIONS NECESSARY FOR THEIR DEVELOPMENT,
Georgia Univ., Athens.
For primary bibliographic entry see Field 2F
W79-02073

SYSTEMATIC ABSORBANCE ERRORS WITH TECHNICON AUTOANALYZER II COLORIMETERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography
P. N. Froelich, and M. E. Q. Pilson
Water Research, Vol 12, No 8, p 599-603, 1978. 4 fig, 5 ref.

Descriptors: *Colorimetry, *Instrumentation, *Sea water, Refractivity, Automation, Equipment, Laboratory tests, Optical properties, Phosphates, Salinity, Aqueous solutions, Light, Absorption, Water properties, Chemical analysis, Autoanalyzer colorimeters, Flowcells.

Technicon AutoAnalyzer II colorimeters have spectrophotometric flowcells with curved optical ends. Light passing through these flowcells is refracted severely at the non-perpendicular ends. Curved ends, therefore, cause differences in apparent absorbance measured at the phototube; the absorbance differences are related to differences in the refractive indices of the solutions in the cells. This can cause significant error in the colorimetric analysis of solutions with different refractive indices (caused, for example, by variations in salinity). This effect is responsible for a systematic error which, for typical AutoAnalyzer determinations of phosphate in seawater or estuarine waters, can approximate 0.2 micro M. (Sims-ISWS)
W79-02074

ION MOBILITIES IN PURE WATER VAPOUR AT SATURATION,
Missouri Univ.-St Louis. Dept. of Physics.
For primary bibliographic entry see Field 1B.
W79-02076

MEASUREMENT OF CHELATING AGENT LEVELS IN MEDIA WITH HIGH CONCENTRATIONS OF INTERFERING METAL IONS,
Missouri Univ.-Columbia. Dept. of Chemistry
For primary bibliographic entry see Field 5A.
W79-02079

ATOMIC ABSORPTION DETECTOR FOR CHROMIUM ORGANOMETALLIC COMPOUNDS SEPARATED BY HIGH SPEED LIQUID CHROMATOGRAPHY,
Missouri Univ.-Columbia. Dept. of Chemistry
For primary bibliographic entry see Field 5A.
W79-02080

TRITIUM IN THE WATERS OF YELLOWSTONE NATIONAL PARK,
Geological Survey, Menlo Park, CA., Water Resources Div., and Geological Survey, Menlo Park, CA., Geologic Div.
For primary bibliographic entry see Field 2F.
W79-02130

ORIGINS OF WATER AND SOLUTES IN THE GEOPRESSURED ZONES OF THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Menlo Park, CA. Water Resources Div.
Y. K. Kharaka, W. W. Carothers, and P. M. Brown
Paper SPE 7505 presented at the 53rd Annual Fall Technical Conference and Exhibition of the Society of Petroleum Engineers of AIME, held in Houston, Texas, October 1-3, 1978. 8 p, 6 fig, 1 tab, 30 ref.

Descriptors: *Gulf of Mexico, *Chemical analysis, *Water analysis, *Geothermal studies, *Thermal water, *Oil fields, Texas, Louisiana, Coasts, Stable isotopes, Analytical techniques, *Formation water, Gulf Coast.

Detailed chemical analyses of 120 formation-water samples from 25 oil and gas fields in coastal Texas and Louisiana show that the salinity of water in the geopressured zones ranges from about 10,000 to 270,000 mg/liter dissolved and may be higher or lower than the salinity of water in the normally pressured zones. The formation waters in the geopressured zones are most probably modified connate waters representing the original marine water of deposition. The chemical composition of these waters, however, is markedly different from that of ocean water. The differences in composition resulted from physical and chemical interactions between water and sediments. (Woodard-USGS)
W79-02131

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02133

INVESTIGATION OF MATRIX INTERFERENCES FOR AAS TRACE METAL ANALYSES OF SEDIMENTS,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-02143

PROCEDURE FOR THE EVALUATION OF ENVIRONMENTAL MONITORING LABORATORIES,
Tracer Jitco, Inc., Rockville, MD.
For primary bibliographic entry see Field 5A.
W79-02149

REDOX POTENTIAL MEASUREMENTS AS AN INDICATION OF BIOCHEMICAL WELL PLUGGING,
Ground Water Associates, Inc., Arlington, MA.
For primary bibliographic entry see Field 5A.
W79-02170

INSTRUMENTS FOR MONITORING THE QUALITY OF NATURAL AND WASTE WATERS,
For primary bibliographic entry see Field 5A.
W79-02214

THE NATURE OF BASALT WEATHERING IN ISRAEL,
Hebrew Univ., Jerusalem, Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W79-02238

APPLICATION OF THE ELECTRICAL DOUBLE LAYER THEORY TO PREDICT ION ABSORPTION IN MIXED IONIC SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
I. Ravina, and Y. Gur.
Soil Science, Vol. 125, No. 4, p 204-209, April, 1978. 3 fig, 3 tab, 16 ref, 16 equ.

Descriptors: *Cation adsorption, Alkali metals, Ions, Hydration, Soil chemistry, *Poisson-Boltzmann equation.

A Poisson-Boltzmann equation including hydration forces and the dielectric saturation effects for describing the electric double layer was presented and compared with the Gouy-Chapman theory. Ionic concentrations in the double layer were calculated by the revised equation showing the specific adsorption of the various alkali metal cations. (Skogerboe-Colorado State)
W79-02314

CHEMICAL CHARACTERIZATION OF LOCAL AND STRATOSPHERIC PLUTONIUM IN OHIO SOILS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W79-02320

THE BEHAVIO OF SULFATE ON SALT INPUT IN PODZOLIC BROWN EARTH,
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldenaehrung.
P. K. Khanna, and F. Beese.
Soil Science, Vol. 125, No 1, p 16-22, January, 1978. 4 fig, 3 tab, 17 ref.

Descriptors: *Sulfates, *Salts, Adsorption, Chemical precipitation, *Podzols, Effluents, *Leachate, Sorption, Inorganic compounds.

The behavior of sulfate concentration in the leachate of an acid podzolic brown earth was studied, when a slug of neutral salt (KCl + KNO3) passed through the upper sulfate-enriched layers of the soil. The effluent of five undisturbed soil columns was collected daily, and H(+), Cl(-), and SO4(--) concentrations were measured. A constant flux of water, either 1.0 cm/day or 0.3 cm/day, was maintained. Sulfate concentration in the leachate showed a decrease when the salt passed the columns. The decrease correspond with an increase of H(+) and Cl(-) concentrations. The behavior of sulfate was almost the same irrespective of the flow rates. At the lower rate, sulfate retention was about twice that at the higher rate. Though precipitation of basic aluminum sulfates cannot be excluded, the behavoir of sulfate must be interpreted in terms of specific adsorption. (Skogerboe-Colorado State)
W79-02321

MECHANISM OF ZINC ADSORPTION BY IRON AND ALUMINUM OXIDES,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
M. Kalbasi, G. J. Racz, and L. A. Loewen-Rudgers.
Soil Science, Vol. 125, No. 3, p 146-150, March, 1978. 1 fig, 1 tab, 13 ref.

Descriptors: *Adsorption, *Zinc, *Iron oxides, *Aluminum oxides, Ion exchange, Aqueous solutions, Soil chemistry, Hydrogen ion concentration, Chlorides.

Adsorption of Zn from aqueous solutions of ZnCl2 by hydrated A1203 and Fe203 was highly pH-dependent and increased markedly with increasing pH. Fe203 had a higher Zn adsorption capacity, at equivalent pH values, than A1203. Experimental observations suggested that surface aqus (-OH2) and hydrono (-OH) groups were involved in Zn adsorption. In addition, experimental observations lead to the postulation that two types of adsorption, specific and nonspecific, depending upon reversibility (exchangeability with Ba(2+)), occurred. Specific and nonspecific adsorptions of Zn(2+) were accounted for 60 to 90 percent and 40 to 10 percent of the total Zn adsorption respectively. For specific adsorption, an olation bridge structure between Zn(2+) and two surface -OH2 groups was postulated; and for nonspecific adsorption, a single-bond structure in which ZnCl(+) replaced one H(+) from surface -OH2 groups was postulated. The ratio of specific to nonspecific adsorption increased with increasing pH. It was concluded that specific adsorption of Zn by A1203 and Fe203 may be at least partially responsible for the frequently reported fixation and unavailability of added Zn to soils. (Skogerboe-Colorado State)
W79-02359

REACTION PRODUCTS AND SOLUBILITY OF APPLIED ZINC COMPOUNDS IN SOME MANITOBA SOILS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
M. Kalbasi, G. J. Racz, and L. A. Lewen-Rudgers.
Soil Science, Vol. 125, No. 1, p 55-64, January, 1978. 4 fig, 6 tab, 26 ref.

Descriptors: *Zinc, *Solubility, *Sulfates, Sulfides, Ammonium compounds, Fertilizers, X-ray diffraction, Calcareous soils, Soil chemistry, *Canada, *Manitoba.

ZnSO4, ZnEDTA, ZnS, and ZnSO4 plus NH4H2PO4 were banded in soils, and the solid-phase zinc compounds were identified using x-ray diffraction analysis. Solubility of zinc in soil adjacent to the fertilizer band was determined by measuring the zinc concentration in soil-water extracts. The reaction product in a noncalcareous soil (pH 8.2) treated with ZnSO4, was Zn(OH)2, which was metastable and persisted for only a few weeks. ZnSO4 was usually precipitated as ZnCO3 and Zn5(CO3)2(OH)6 in the calcareous soils. No crystalline reaction products were detected in soils treated with ZnEDTA. Zn5(CO3)2(OH)6 and Ca(Zn(OH)3)2.2H2O were found in a calcareous soil treated with ZnS and incubated for 32 weeks. Zn3(PO4)2.4H2O and NH4ZPO4 were identified in soils treated with ZnSO4 plus NH4H2PO4. Concentrations of zinc in water extracts of soils treated with zinc increased in order: ZnS, ZnSO4, ZnEDTA. Zinc concentration in water extracts of soils treated with ZnSO4 or ZnEDTA decreased with time of incubation, whereas it increased in soils treated with ZnS. Addition of phosphate to ZnSO4 decreased zinc concentrations in soil-water extracts, as compared to soils treated only with ZnSO4. (Skogerboe-Colorado State)
W79-02362

RESIDUAL FORMS OF FERTILIZER NITROGEN IN FIELD SOILS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
S. J. Smith, F. W. Chichester, and D. E. Kissel.
Soil Science, Vol. 125, No. 3, p 165-169, March, 1978. 1 fig, 2 tab, 17 ref.

Descriptors: *Fertilizers, *Nitrogen, Chemical analysis, *Nitrates, Chemical reactions, Aerobic conditions, Soil chemistry.

Residual fertilizer N was characterized in Houston Black clay and Keene silt loam surface soils from recent field microplot-N balance studies involving liberal (328-560 kg N/ha) 15N-labeled rates. Results indicate residual N is readily distributed in all the organic and inorganic soil N forms, even after the first cropping season. An equivalent distribution of the residual N with the indigenous soil N, however, had not occurred after three years. During this period the residual N was more than twice as susceptible to mineralization as the soil N. Most of the residual N was incorporated in amino acid N-forms. (Skogerboe-Colorado State)
W79-02364

HULA VALLEY PEAT: REVIEW OF CHEMICAL AND GEOCHEMICAL ASPECTS,
Hebrew Univ., Jerusalem (Israel) Dept. of Organic Chemistry.
S. Brenner, R. Ikan, N. A. Agron, and A. Nissenbaum.
Soil Science, Vol. 125, No. 4, p 226-232, April, 1978. 3 fig, 2 tab, 32 ref.

Descriptors: *Peat, *Chemical properties, *Pleistocene epoch, Inorganic compounds, Organic matter, Stable isotopes, Geochemistry, *Israel(Hula Valley), Chlorides.

In the Hula Valley, Israel, four layers of peat of Middle Pleistocene to Holocene age, interbedded with limnic clays and marls, are found above 300-m depth. The main detrital minerals are kaolinite, montmorillonite, and illite. Average elemental values of organic and inorganic matters (on dry basis) present in each horizon and average calorific values of each horizon are reported. Organic constituents of the upper layer have been identified. A detailed quantitative investigation of the distribution with depth in the top peat layer of the humic, fulvic, and hymatomelanic acids, as well as of the beta-humus and humin, showed humin to be the dominant fraction of the organic matter. Analysis of the peat organic fractions for carbon and hydrogen stable isotopes shows that with depth the difference in delta C13 between the humic and fulvic acids disappears and the delta C13 stabilized at around-18 parts per thousand. The isotope data indicate the dynamic nature of the fulvic acid in the peat. The delta D values were around-60 parts per thousand, but the data are too meager for any firm conclusion. (Skogerboe-Colorado State)
W79-02365

A STATISTICAL EVALUATION OF SOME COLUMBIA RIVER BASALT CHEMICAL ANALYSIS,
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
For primary bibliographic entry see Field 5A.
W79-02433

Group 2K—Chemical Processes

EFFECTS OF TEMPERATURE AND TIME ON HYDROXY ALUMINUM PHOSPHATE-MONTMORILLONITE COMPLEX,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2G.
W79-02436

SUPERCOOLING OF WATER TO -92 DEGREES C UNDER PRESSURE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry
For primary bibliographic entry see Field 2C.
W79-02494

2L. Estuaries

AMMONIUM OXIDATION AND ITS SIGNIFICANCE IN THE SUMMER CYCLING OF NITROGEN IN OXYGEN DEPLETED SKAN BAY, UNALASKA ISLANDA, ALASKA,
Tokyo Univ. (Japan). Ocean Research Inst
For primary bibliographic entry see Field 5C.
W79-02004

POTENTIAL IMPORTANCE OF BENTHIC CYSTS OF GONYAULAX TAMARENSIS AND G. EXCAVATA INITIATING TOXIC DINOFLAGELLATE BLOOMS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C
W79-02011

ROLE OF INORGANIC IONS IN CONTROLLING SEDIMENTATION RATE OF A MARINE CENTRIC DIATOM DITYLUM BRIGHTWELLI,
California Univ., Santa Barbara. Dept. of Biological Sciences
For primary bibliographic entry see Field 5C.
W79-02014

SYSTEMATIC ABSORBANCE ERRORS WITH TECHNICON AUTOANALYZER II COLORIMETERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography
For primary bibliographic entry see Field 2K.
W79-02074

AMINO ACIDS IN SALT MARSH DETRITUS,
Mississippi State Univ., Mississippi State. Dept. of Zoology
For primary bibliographic entry see Field 5C.
W79-02086

THE NATURE OF GROWTH FORMS IN THE SALT MARSH GRASS SPARTINA ALTERNIFLORA,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
I. Valiela, J. Teal, and W. Deuser
The American Naturalist, Vol. 112, No. 985, p 461-470, May-June, 1978. 4 fig, 1 tab, 32 ref.

Descriptors: *Salt marshes, *Grasses, *Plant growth, Rooted aquatic plants, Vegetation, Seeds, Marshes, Genetics, Succession, Nutrients, Nitrogen, Fertilization, Massachusetts, Spartina alterniflora tall form, Spartina alterniflora short form.

Long term fertilization was conducted on plots of Spartina alterniflora in Great Sippewissett Marsh, Massachusetts. Increases in nutrinet supply convert short form S. alterniflora into plants resembling the tall form in biomass/sq.m. and morphology. Competition for light is a probably cause of the tall form's growth habit. Added nutrients led to larger delta C13 values probably due to incorporation of heavier carbon from internal air spaces of S. alterniflora during high tide, when exchange of gases with the atmosphere is prevented. Interstitial water replenished at each tide is greater in areas supporting the tall-form vegetation. Greater densities of marsh mussels are found in tall-form areas. Their feeding and defecation lead to larger accumulations of particulate matter and nutrients in those areas. Nitrogen amounts delivered by algal nitrogen fixation does not differ greatly under the two forms. Seedling establishment usually produces tall-form plants. A higher percentage of tall form plants than short form produce seed. Electrophoretic results show no genetic differences; therefore, the form of seedlings is probably the result of competition for nutrients and is modified by other factors. Usually seedlings become established at the edge of banks and grow into tall plants. Sedimentation resulting in elevated marsh surfaces and consequent competition by extant plants producing vegetatively results in short plants. This succession may be reversed by an increase in nutrient supply. This pattern over time and space is probably found in a variety of other aquatic plants.
W79-02087

DO TIDES AFFECT COASTAL INSECT COMMUNITIES,
Houston Univ., TX. Dept. of Biology.
G. N. Cameron.
The American Midland Naturalist, Vol 95, No 2, p 279-287, April 1976. 4 tab, 32 ref.

Descriptors: *Tides, *Insects, *Communities, *Tidal effects, Marshes, Coastal marshes, Salt marshes, Flooding, Water level fluctuations, Vegetation, Marsh plants, Population.

Clip-quadrat samples taken prior to, during and after inundating tides in Salicornia and Spartina salt marshes during 1 year revealed that periodic tidal inundation had little effect upon the number of adult species or their vertical stratification within the marsh vegetation. Possible explanations for the insects remaining in the marsh during inundation are considered. Sorensen's Quotient of similarity demonstrated little alteration in species composition, and a trophic analysis showed no change in the relative proportion of herbivores, saprovores or predators as a result of inundation. The possibility that salt-marsh insects remaining in place on the vegetation during inundating tides may be a result of early morning sampling is considered. Early morning low temperatures suppress the insect's metabolic rate and increase the chance of survival during inundation on the limited amount of oxygen available in surface bubbles. These findings support previous conclusions that salt-marsh insect populations are regulated primarily by biological rather than physical factors. (Maroncelli-Mass)
W79-02089

THE DISTRIBUTION OF JUNCUS ROEMERIANUS IN THE SALT MARSHES OF NORTH AMERICA,
Gulf Coast Research Lab., Ocean Springs, MS.
L. N. Eleuterius
Chesapeake Science, Vol 17, No 4, p 289-292, December, 1976. 1 fig, 1 tab, 25 ref.

Descriptors: *Aquatic plants, *Salt marshes, *Distribution, *North America, Coastal marshes, Marshes, Wetlands, Gulf coastal plain, Atlantic coastal plain, Distribution patterns, Juncus roemerianus.

Although scattered individuals of Juncus roemerianus Scheele may be found northward in New Jersey, Long Island, New York, Connecticut and southward along the Laguna Madra in Texas, Mexico, and on the Caribbean Islands, the species is most prevalent within the South Atlantic and Gulf coastal marshes of the eastern United States. Here there are approximately 3,174,333 hectares of salt marsh of which 72.9% occur on the Gulf coast and 27.1% on the Atlantic coast. Juncus roemerianus dominates 20.7% of the marsh in the south Atlantic states and 7.3% of the Gulf coast marshes, but covers more marsh area on the Gulf coast (170,067 hectares) than on the Atlantic coast (149,316 hectares). Thus, there are approximately 320,000 hectares of salt marsh dominated by J. roemerianus in North America. (Maroncelli-Mass)
W79-02093

BIOCHEMICAL AND TRANSPIRATION STUDIES OF THE GROWTH FORM OF SPARTINA ALTERNIFLORA ON CONNECTICUT SALT MARSHES,
Connecticut Coll., New London. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02101

THE AUTECOLOGY OF SAWGRASS IN THE FLORIDA EVERGLADES,
Agricultural Research Service, Fort Lauderdale, FL. Southern Region.
K. K. Steward, and W. H. Ornes.
Ecology, Vol. 56, No. 1, p 162-171, Winter, 1975. 4 fig, 9 tab, 26 ref

Descriptors: *Plant ecology, *Rooted aquatic plants, *Florida, Ecology, Nutrients, Seasonal, Standing crops, Nutrient requirements, Marshes, Wetlands, Primary productivity, Nitrogen, Phosphorus, Potassium, Copper, *Sawgrass

Standing crop, plant density, stem length, leaf numbers, growth rate, and nutrient relationships in plant tissue, soil, and water were estimated monthly over a 12-18 mo period in mature sawgrass stands as well as in stands regrowing after fires. Daily rainfall and water depth were also measured. Mature stands showed little seasonal variation in standing crop, plant density, and concentration of most inorganic nutrients. Plant nutrient requirements were estimated to be low because nutrient levels in tissues were low as compared to those of other Everglade macrophyte species. Copper (Cu) and phosphorus (P) were particularly low. Levels of available nutrient in soil varied with no seasonal pattern. Most nutrients were in adequate supply, except that available nitrogen (N), P, potassium (K) and Cu were generally very low. Concentration of most nutrients in culms regrowing after fires was high during early growth stages, but decreased to levels found in older culms after 3-5 mo. Concentrations of calcium, iron, and zinc were exceptions. After 18 no growth, burned stands had produced only 38% of the standing crop contained in unburned mature stands. The apparent low nutrient requirements of sawgrass may partially explain the dominance of this plant in the marsh community. (Stihler-Mass)
W79-02104

AN EXAMINATION OF LEGISLATION FOR THE PROTECTION OF THE WETLANDS OF THE ATLANTIC AND GULF COAST STATES,
Mississippi Univ., University. School of Law
For primary bibliographic entry see Field 6E
W79-02106

ANGIOSPERM PRODUCTION OF THREE VIRGINIA MARSHES IN VARIOUS SALINITY AND SOIL NUTRIENT REGIMES,
Virginia Inst. of Marine Science, Gloucester Point, VA
I. A. Mendelssohn, and K. L. Marcellus
Chesapeake Science, Vol 17, No 1, p 15-23, March, 1976. 5 fig, 6 tab, 52 ref.

Descriptors: *Vegetation, *Productivity, *Marshes, Salinity, Nutrients, Soils, Nitrogen, Phosphorus, Salt marshes, Estuaries, Rooted aquatic plants, Angiosperms, Oligohaline, Mesohaline, Euhaline, Virginia

The net aerial angiosperms productivity, salinity, and soil nutrient composition were determined for three Virginia marshes. Oligohaline Ware Creek Marsh and mesohaline Carter Creek Marsh were most productive, 563 and 572 g/sq m/yr, respectively, while euhaline Wachapreague Marshes was least productive, 362 g/sq m/yr. Species in Carter and Ware Creek Marshes were clustered into associations based on salinity tolerance. Nitrogen and phosphorus concentrations of Spartina alterniflora tissue were high in the spring and decreased as the growing season continued. Soil nutrient concentrations were variable and trends during the growing season were not discernible. No significant correlations were found between soil and plant nutrient concentrations. Although the empirical data sug-

gests that high soil salinity and low soil nitrogen and phosphorus concentrations limited primary productivity in Wachapreague Marsh, a multiple regression of standing crop on these parameters did not delineate any as the primary factors limiting salt marsh production. (Maroncelli-Mass)
W79-02108

AN ATLAS OF VASCULAR PLANT SPECIES DISTRIBUTION MAPS FOR TIDEWATER MARYLAND,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2I.
W79-02109

A BIBLIOGRAPHY OF MARYLAND'S TIDAL WETLANDS (MARSHES-SWAMPS),
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
W. S. Sipple.
Wetland Publication No. 3, July, 1978. 544 ref.

Descriptors: *Bibliographies, *Wetlands, *Maryland, Coastal marshes, *Tidal marshes, Swamps, Waterfowl, Wading birds, Marsh plants, Submerged plants, Wildlife, Marsh management.

Reference include information on Maryland wetland vegetation, flora, fauna, ecology, management, planning, law, soils, and ontogeny. Faunal references include predominantly those groups that are most characteristic of vegetated wetlands such as waterfowl, wading birds, furbearers, some amphibians and reptiles, wetland invertebrates, fish references have not been included. Materials on submerged aquatic vascular plants are also included because of their importance to waterfowl. (Steiner-Mass)
W79-02111

BARRIER ISLANDS OF THE ATLANTIC AND GULF COASTS OF THE UNITED STATES: AN ANNOTATED BIBLIOGRAPHY,
Gulf South Research Inst. Baton Rouge, LA.
J. D. Bagur.
Fish and Wildlife Service, Biological Services Program, April, 1978, Report FWS/OBS-77/56. 215 p. 14-16-0008-2113.

Descriptors: *Bibliographies, *Barrier Islands, *Atlantic Ocean, Coast, Atlantic coastal plain, Gulf coastal plain, Gulf of Mexico, Wildlife, Vegetation, Geology, Wetlands, Islands.

The 953 entries are arranged geographically by state and by island from Maine to Texas. Under each island name, entries appear in alphabetical order by senior author's last name. Annotations are provided in all but a few cases. Author and subject indices are provided. (Stihler-Mass)
W79-02113

EFFECTS OF SIMULATED FLOODING ON ALLIGATOR EGGS,
Louisiana Wildlife and Fisheries Commissionm, Grand Chenier.
T. Joanen, L. McNease, and G. Perry.
Paper presented at 31st Annual Meeting, Southeastern Association of Game and Fish Commissioners, October 9-12, 1977, San Antonio, Texas. 7 p. 2 tab, 6 ref.

Descriptors: *Submergence, *Hatching, *Flooding, Wetlands, Coastal marshes, Hurricanes, Wildlife, Reptiles, Mortality, Louisiana, *Alligator, *Eggs, Simulation analysis.

Alligator (Alligator mississippiensis) eggs were collected at four intervals during incubation and subjected to a single submergence to test the effects of flooding on hatchability. Treatments consisted of a 2-hour, 6-hour, 12-hour, and a 48-hour submergence. Hatching success was significantly related to the duration of immersion. Minor flooding can be tolerated, however, extended submergence for 12 hours or longer after the first 30 days of incubation produced total mortality. (Stihler-Mass)
W79-02116

FOOD HABITS OF COASTAL MARSH RACCOONS WITH OBSERVATIONS OF ALLIGATOR NEST PREDATION,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
D. M. Fleming, A. W. Palmisano, and T. Joanen.
Presented to the 30th Annual Conference of the Southeastern Association of Game and Fish Commissioners, October, 1976, Jackson, Mississipi, 23 p, 1 fig, 3 tab, 14 ref.

Descriptors: *Food habits, *Predation, *Mammals, *Reptiles, *Nests, *Coastal marshes, Food abundance, Crustaceans, Wildlife, Freshwater marshes, Flooding, Water levels, Seasonal, Marking techniques, Dye releases, Wetlands, Louisiana, *Raccoon, *Alligator, Intermediate marshes, Brackish marshes, Eggs.

Food habits of the coastal marsh raccoon, Procyon lotor magalodous Lowery, in Louisiana were studied from June 1973 to August 1974. The raccoon's role as predator of the eggs and hatchlings of the American alligator, Alligator mississippiensis, was also evaluated. Visual observations of nest predation, information obtained from radio-instrumented raccoons, and the use of Rhodamine B dye solution to spray egg clutches were utilized in data gathering. Scats were collected and examined for alligator remains or traces of the dye. Eight hundred and sixty-six raccoon scats were collected from the fresh, intermediate and brackish marsh types, an average of 24 scats per month per habitat type. Crustaceans were the major food item and comprised 49 percent of the yearly diet of raccoons. Fruits were important fall foods. Although not utilized in great quantities, insects were also important, particularly during periods of prolonged marsh flooding. A marked difference occurred between years in the incidence of raccoon predation on alligator nests ranging from no predation in the 1973 nesting season to 45 percent in 1974. The difference was believed related to water level and its influence on the feeding behavior and subsequent movement patterns. (Maroncelli-Mass)
W79-02117

ALLIGATOR DIETS IN RELATION TO MARSH SALINITY,
Louisiana Wildlife and Fisheries Commission, Grand Chenier.
L. McNease, and T. Joanen.
Paper presented at the 31st Annual Meeting of the Southeastern Association of Game and Fish Commissioners, October 9-12, 1977, San Antonio, Texas. 11 p, 2 tab, 10 ref.

Descriptors: *Food habits, *Salinity, *Marshes, Louisiana, Wetlands, Reptiles, *American alligator.

Three hundred and fourteen large American alligators (Alligator mississippiensis) collected in the marshes of southwest Louisiana in conjunction with 1972 and 1973 autumn hunting seasons were examined for food contents. Foods were categorized by year and marsh type (brackish, intermediate, and fresh). Vertebrates were the most important foods consumed, of which mammals comprised the largest percentage by weight. Arthropods and fish were important foods in the more saline areas. Thirteen percent of the adult females contained alligator eggs or egg shells in their stomach. (Stihler-Mass)
W79-02118

ORIGINS OF WATER AND SOLUTES IN THE GEOPRESSURED ZONES OF THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-02131

DISTRIBUTION OF SURFICIAL SEDIMENTS AND EELGRASS IN NEW YORK'S SOUTH SHORE BAYS: AN ASSESSMENT FROM THE LITERATURE,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
C. R. Jones, and J. R. Schubel.
Special Report 13, Reference 78-1, July 1978. 89 p, 31 fig, 22 tab, 33 ref, 3 append.

Descriptors: Grasses, *Sediment distribution, *New York, Bibliographies, Bays, *Eelgrass, *Sea grasses, Zostera marina.

An investigation was completed of all published and unpublished information available on the distributions of surficial sediment and eelgrass (Zostera marina) in New York's south shore bays. This report presents graphical and tabular summaries of findings for sediment texture and eelgrass cover. (NOAA)
W79-02162

YOU CAN TAILOR EFFLUENT BOD TO FIT THE RECEIVING-WATER ECOSYSTEM...AND ENHANCE THE ENVIRONMENT. URBAN AND FISH-PROCESSING WASTES IN THE MARINE ENVIRONMENT: BIOENHANCEMENT STUDIES AT TERMINAL ISLAND, CALIFORNIA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
For primary bibliographic entry see Field 5E.
W79-02164

TRANSPORTATION AND ACCUMULATION OF FINE-GRAINED SEDIMENTS IN THE ESTUARINE ENVIRONMENT: RECOMMENDATIONS FOR RESEARCH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, H. J. Bokuniewicz, and R. B. Gordon.
Special Report No. 14, Reference 78-2, July 1978. 17 p, 2 append.

Descriptors: *Estuarine environment, *Sediment transport, *Estuaries, Sedimentary processes, Fine-grained sediments.

A Workshop on Transport Processes in Estuaries was held at the Marine Sciences Research Center, State University of New York, Stone Brook, New York from 10 November to 14 November 1976. Thirty-one participants from some 18 institutions and agencies focused their discussions on transport of water, salt, and fine-grained suspended sediments. It was concluded that there is no comprehensive method for comparing different estuarine sedimentary regimes. The kinds of studies recommended are designed to produce, not only a better understanding of estuarine transport mechanisms, but more specifically to produce, a significant improvement of knowledge of those sedimentary processes that characterize estuarine systems. Development of an estuarine sediment system will require sustained research programs over periods of years, perhaps decades. Some of the more important research components of an estuarine sediment system may be of local, or regional importance and should be supported by appropriate State and Federal agencies. Regional funding mechanisms should be established to ensure sustained support of research and monitoring of estuarine systems. (NOAA)
W79-02165

SUBSURFACE GEOLOGICAL INVESTIGATION OF A PLEISTOCENE BRAIDED STREAM IN THE NORTHERN COASTAL PLAIN, DELAWARE (U.S.A.),
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 2J
W79-02167

FLOTATION OF FRESH WATER ON SEA WATER, A HISTORICAL NOTE,
Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources.
For primary bibliographic entry see Field 2F.
W79-02171

DREDGE SPOIL IN MISSISSIPPI SOUND,
University of Southern Mississippi, Hattiesburg.
For primary bibliographic entry see Field 5E.
W79-02188

INTERTIDAL ENVIRONMENT OF NORTHERN DUBLIN BAY,
Trinity Coll., Dublin (Ireland). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-02204

MECHANISM OF FORMATION AND FORECAST OF THE DEVELOPMENT OF THE VOLGA DELTA,
For primary bibliographic entry see Field 2J.
W79-02210

SEICHES IN THE BALTIC SEA AND THEIR EFFECT ON FLOODS IN THE NEVA RIVER DELTA,
B. A. Pomytkin.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 68-72, 1977. 4 fig, 2 tab, 14 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 109, No. 2, p 143-149, 1977.

Descriptors: *Seiches, *Oceans, *Deltas, *Surges, Floods, On-site investigations, Waves(Water), Gulfs, Water level fluctuations, Frequency, Sea level, Wind tides, Tides, Foreign research, Foreign countries, *USSR, *Baltic Sea, *Gulf of Finland, *Neva River Delta(USSR).

This paper was based on published material and on an analysis of recent marigrams of some gaging stations in the Gulf of Finland. Seiches observed in the Baltic Sea and in the Gulf of Finland were described on the basis of published data and field observations in 1973-1974. It was concluded that: (1) Periodically recurring standing waves, i.e., seiches, are observed throughout the year in the Baltic Sea and at the head of the Gulf of Finland. (2) Seiches with an oscillation period of 8 hours, forming during the passage of a cyclonic front across the Gulf of Finland and having an average oscillation amplitude of 20-30 cm and a maximum amplitude to 100 cm, are most frequent. (3) The next in frequency is a two-node seiche with a 24-hour period, an average amplitude of 40-50 cm, and a maximum amplitude to 150 cm. (4) Seiche oscillations, by becoming superposed on high water in the Neva delta, can cause an additional rise in level in the delta during a storm time of 50-60 cm or more. However, alone, in pure form, they cannot cause floods in Leningrad. (Humphreys-ISWS)
W79-02213

SURFACE DRIFTER MOVEMENTS OBSERVED IN PORT ANGELES HARBOR AND VICINITY, APRIL 1978,
Evans-Hamilton, Inc., Seattle, WA.
C. C. Ebbesmeyer, J. M. Cox, and J. M. Helseth.
NOAA Technical Memorandum ERL MESA-31, September 1978. 205 p, 7 fig, 3 tab, 7 ref, 6 plates.

Descriptors: *Estuaries, *Tidal effects, *Eddies, *Wind, Oil spills, Drifting(Aquatic), Washington, Port Angeles Harbor(Wash), *Surface drifters, Oil slicks, Strait of Juan de Fuca(Wash).

Described is a field experiment in which movements of surface drifters were observed nearshore within a fjord-like estuary, the Inner Strait of Juan de Fuca, Washington. The study area straddles a major sill (Green Point to Victoria) terminating between two prominant spits (Ediz Hook and Dungeness Spit). Reported herein for 23-30 April 1978 are position and trajectories for three types of drifting objects released primarily in the vicinity of Port Angeles Harbor (behind Ediz Hook): (1) 123 drift sheets - 10 to 15 each positioned several times per hour during daylight using a small aircraft; (2) 700 drift cards - 240 shore recoveries tabulated; and (3) 46 drogues - 4 to 5 each positioned several times per hour during daylight using a small craft. Preliminary analysis indicates complex patterns of tidal eddies and a tendency for westerly winds to drive floatable materials onshore. (NOAA)
W79-02221

SEASONAL FLUCTUATION OF WATER QUALITY (NUTRIENTS AND PIGMENTS) IN LOWER DELAWARE BAY,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W79-02223

PHOTOSYNTHETIC RATES OF MARINE ALGAE AS A FUNCTION OF INORGANIC CARBON CONCENTRATION,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5C.
W79-02224

NUTRIENT AND PARTICULATE FLUXES IN A SALT MARSH ECOSYSTEM: TIDAL EXCHANGES AND INPUTS BY PRECIPITATION AND GROUNDWATER,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W79-02235

SOFT-SHORE MACROBENTHOS ALONG THE SOUTH-WEST COAST OF WALES,
University Coll. of Swansea (Wales). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02240

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02242

INTERSTITAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 2. NUTRIENT REGENERATION AND PHOSPHATE REMOVAL,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5C.
W79-02243

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA, WASHINGTON, IX. FACTORS CONTROLLING THE SEASONAL CYCLE OF NITRATE IN THE SURF AT COPALIS BEACH (1971 THROUGH 1975),
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02244

A BUDGET OF NITROGEN RECYCLING IN NORTH SEA SEDIMENTS OFF THE BELGIAN COAST,
Brussels Univ. (Belgium). Lab. d'Environnement.
For primary bibliographic entry see Field 5C.
W79-02245

FLUME EXPERIMENTS ON SAND, SILT, AND CLAY MIXTURES FROM THE OFFSHORE DREDGED MATERIAL DISPOSAL SITE, GALVESTON, TEXAS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5E.
W79-02348

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON, EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5C.
W79-02350

PHYSICAL MODEL SIMULATION OF THE HYDRAULICS OF MASONBORO INLET, NORTH CAROLINA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-02353

VELOCITY AVERAGING IN ESTUARIES CHARACTERIZED BY A LARGE TIDAL RANGE TO DEPTH RATIO,
South Carolina Univ., Columbia. Dept. of Geology
B Kjerfve
Estuarine and Coastal Marine Science, Vol. 3, p 311-323, 1975, 4 fig, 4 tab, 17 ref. OWRT B-035-GA(3), 14-31-0001-1892.

Descriptors: *Estuaries, *Flow rates, Water circulation, Tidal waters, *Estuarine flow velocities, Velocity profiles.

A general procedure to compute net velocity profiles is proposed for estuaries with a large ratio, Epsilon, of tidal range to mean water depth. Such a technique is desirable in view of the continued interest and numerous and varied research efforts in shallow estuarine waters where flow informaion is essential. Because epsilon exceeds 0.3 in many coastal plain and bar-built estuaries, problems arise in the computation of time-averaged velocity profiles. However, by non-dimensionalization of the depth before time-averaging, these problems are avoided. Rational procedures for the calculation of flow discharge and flux of dissolved and suspended constituents are also proposed for estuaries with a large epsilon-ratio. The averaging procedures are illustrated by computations on 561 velocity profiles measured in the Duplin River, A Georgia (U.S.A) coastal plain estuary with epsilon = 0.5.
W79-02355

EARTHQUAKE-INITIATED CHANGES IN THE NESTING HABITAT OF THE DUSKY CANADA GOOSE,
Rutgers - The State Univ., Newark, NJ. Dept. of Botany
For primary bibliographic entry see Field 2I.
W79-02416

THE VEGETATION OF SOUTHERN FLORIDA,
University of South Florida, Tampa. Dept. of Biology
For primary bibliographic entry see Field 2I.
W79-02425

EFFECT OF DISSOLVED OXYGEN AND REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP AND MARSH SOILS.
Louisiana State Univ., Baton Rouge. Dept. of Agronomy
For primary bibliographic entry see Field 5C.
W79-02426

EFFECTS OF AN ORGANIC ARSENICAL HERBICIDE ON A SALT MARSH ECOSYSTEM,
Auburn Univ., AL. Dept. of Biology; and Auburn Univ., AL. Dept. of Microbiology
For primary bibliographic entry see Field 5C.
W79-02427

HYPERSALINE LAGOONAL DEPOSITS AND PROCESSES,
University of Southern California, Los Angeles

pt. of Geological Science.
P. Vonder Haar, and D. S. Gorsline.
ailable from the National Technical Information
vice, Springfield, VA 22161 as ADA-034 208,
ce codes: A03 in paper copy, A01 in microfiche.
port USC-GEOL 76-02, April, 1976. 42 p, 8 fig,
ab, 62 ref.

scriptors: *Saline water systems, *Lagoons,
tlands, Marshes, Saline lakes, Saline water, Sa-
ty, Salt marshes, California, Pacific coast
ion, Baja(Mexico), Sonora coast(Mexico),
guna Mormona(Mexico), Saline
ande(Mexico), Ometepec Salina(Mexico).

aporite and algal-carbonate sediments are accu-
lating in coastal lagoons along the Pacific and
lf of California coasts of Baja California and
nora, Mexico. Analysis of the cycles of deposi-
n was made using three years of ERTS imagery
h ground surveys to establish the ERTS analy-
These data plus field work document rates of
imentation of the facies type. Fluctuations of
level and subsidence can produce vertical
clic successions of marine marginal evaporite
ies with terrigenous or marine facies. The geo-
ic record show stacks of such sabkha cycles of
ages and confirm Shearman's observation that
kha measures of desert coasts are as significant
coal measures of more humid coasts. (Steiner-
ss)
79-02430

FECTS OF THERMAL DISCHARGES ON
ORTALITY OF MERCENARIA MERCEN-
IA IN BARNEGAT BAY, NEW JERSEY,
sey Central Power and Light Co. Morristown,
. Environmental Affairs Dept.
r primary bibliographic entry see Field 5C.
79-02473

CO-BIOCHEMICAL STUDIES ON SOME
CONOMICALLY IMPORTANT INTERTIDAL
GAE FROM PORT OKHA (INDIA),
urashta Univ., Rajkot (India). Dept. of Bios-
nces.
r primary bibliographic entry see Field 5C.
79-02475

RGANCHLORINES IN CODFISH FROM
ARBOURS ALONG THE NORWEGIAN
OAST,
orges Veterinarhoegskole, Oslo. Dept. of Phar-
cology and Toxicology.
r primary bibliographic entry see Field 5C.
79-02479

HE POLLUTION OF SEA-WATER IN NAGA-
KI BAY IN SUMMER 1976 AND 1977, (IN
PANESE),
gasaki Univ. (Japan). Faculty of Fisheries.
r primary bibliographic entry see Field 5B.
79-02482

FFECT OF BARITE (BASO4) ON DEVELOP-
ENT OF ESTUARINE COMMUNITIES,
vironmental Research Lab., Gulf Breeze, FL.
r primary bibliographic entry see Field 5C.
79-02484

HE EFFECTS OF PETROLEUM ON THE
ALT MARSH ECOSYSTEM,
ollege of William and Mary, Williamsburg, VA.
ept. of Marine Sciences.
r primary bibliographic entry see Field 5C.
79-02485

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALINATION REVERSE OSMOTIC MEMBRANES AND THEIR PREPARATION,
Shinetsu Chemical Co., Tokyo (Japan). (Assignee).
S. Arai, and F. Akiya.
U.S. Patent No. 4,111,810, 4 p, 2 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 331, September 5, 1978.

Descriptors: *Patents, *Desalination, *Waste water treatment, *Water quality control, Reverse osmosis, Membrane processes, Membranes, Semipermeable membranes, Separation techniques, Chemical properties, Strength, Chitin, Chitosan.

Semipermeable membranes useful in reverse osmosis and a process of preparing them comprises deacetylating naturally occurring chitin to produce chitosan. A film of chitosan salt is made from an acid diluted aqueous solution of the chitosan having free amino groups by neutralizing the acid groups, and then subjecting the film of chitosan to a chemical treatment with an organic acid. The chitosan is converted to the acetylated form, having a degree of acetylation from about 0.3 to 0.8, to produce the reverse osmotic membranes. The products have excellent chemical properties as well as mechanical strengths sufficient to withstand the pressure difference in the operating condition. (Sinha-OEIS)
W79-02338

3B. Water Yield Improvement

FACTORS INFLUENCING USEFULNESS OF ANTITRANSPIRANTS APPLIED ON PHREATOPHYTES TO INCREASE WATER SUPPLIES,
California Univ., Davis.
D. C. Davenport, R. M. Hagan, L. W. Gay, B. E. Kynard, and E. K. Bonde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 171, Price codes: A09 in paper copy, A01 in microfiche. Contribution No. 176, Water Resources Center, University of California 1978, p 181, 108 fig, 60 tab, 159 ref, 10 append. OWRT C-6030 (No. 5235)(4), 14-31-0001-5235.

Descriptors: *Antitranspirants, *Evapotranspiration, *Phreatophytes, *Water yield improvement, *Wildlife habitat, Ecological balance, Energy budget, Lysimeter, Micrometeorology, Photosynthesis, Saltcedar, Stomata, Riparian water loss, *Transpiration control, *Riparian phreatophytes.

The continuous availability of groundwater to riparian phreatophytic vegetation such as saltcedar (Tamarix sp.) and cottonwood (Populus sp.) results in large transpiration rates usually coincide with peak consumer demands for ground- and streamwater. Removal of this vegetation can cause ecological imbalances and be environmentally and aesthetically unacceptable. Spraying a nontoxic antitranspirant (AT) on phreatophyte foliage, on the other hand, may reduce transpiration losses and also preserve the vegetation. This research project therefore investigates: (1) the magnitude of water lost through transpiration by phreatophytes using gravimetric, lysimetric and energy budget techniques; (2) plant and environmental factors which influence the water relations of the vegetation, using porometer, pressure chamber, and gas-exchange measurements; (3) selection of suitable AT materials by laboratory and greenhouse screening tests; (4) field testing of ATs, sprayed from the ground and by air, for transpiration reduction; and (5) AT effects on terrestrial and aquatic wildlife of riparian habitats using acute toxicity and other experiments. Conclusions are made on: (1) phreatophyte transpiration rate as affected by environment, plant density, and species; and (2) the benefits of AT treatment, as an alternative to phreatophyte eradication, for water conservation, improvement in water quality, and preserving the environment and ecological balance. (Snyder-Calif, Davis)
W79-02291

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
J. D. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 955, Price codes: A11 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper, No. 13, October 1978, 216 p. 84 fig (inc. photos), 2 tab, 174 ref. OWRT W-211(No 6254)(2).

Descriptors: *Landscaping, *Southwest U.S., *Aesthetics, *Vegetation establishment, *Soil-water-plant relationships, *Drought resistance, *Drought-tolerance, Mulching, Design criteria, Lawns, Ornamentals, Shrubs, Trees, Desert plants, Shelterbelts, Drip irrigation, Water harvesting, Plant physiology, Erosion control, Xerophytes, Vegetation effects.

Landscape architecture (environmental design) in the hot, arid southwestern U.S. must respond to the extremes of climate, the distinctive landforms, and the vegetative communities that combine to create unique patterns within the desert landscape. Human comfort is defined and serves as a criterion for the manipulation of microclimates to achieve a relative sense of comfort within a hot arid environment. Methods of solar radiation control, wind control, and conservation of water resources are reviewed. The text is supplemented with many illustrations and drawings. Over 200 drought-tolerant plant species are listed for use in the desert landscape. Cultural information for each plant is included in a matrix, and many of the plants so described are represented photographicaly as well. In addition to the references used for the text, a computerized bibliography, includng abstracts, of related topics is added in the appendix.
W79-02389

ESTABLISHMENT OF NATIVE PLANTS FOR THE REHABILITATION OF PARAHO PROCESSED OIL SHALE IN AN ARID ENVIRONMENT,
Utah State Univ., Logan. Inst. for Land Rehabilitation.
For primary bibliographic entry see Field 4A
W79-02391

3C. Use Of Water Of Impaired Quality

TRANSPIRATION EFFECTS ON LEACHING FRACTIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
A. Meiri, J. Kamburov, and J. Shalhevet.
Agronomy Journal, Vol. 69, No. 5, p 779-782, September-October 1977. 2 fig, 2 tab.

Descriptors: *Leaching, *Infiltration, Soil water, Soil moisture, *Soil water movement, Saline water, Irrigation water, Salinity, Salts, Seepage, *Transpiration.

Water uptake by plants during the processes of infiltration and redistribution may introduce considerable errors in actual leaching when calculations are based on preirrigation soil water deficit. The objective of this study was to measure and demonstrate the importance of this water uptake in causing a reduction in the actual leaching. (Skogerboe-Colordo State)
W79-02019

SUGAR CANE GROWTH IN RESPONSE TO MULCH AND FERTILIZER ON SALINE-ALKALI SUBSOILS,
Ministry of Overseas Development (England).
B. W. Eavis, and E. R. St. J. Cumberbatch.
Agronomy Journal, Vol 69, No 5, p 839-842, September-October, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Mulches, *Sugar cane, *Crop response, Crop production, *Fertilizers, Fertilization, Nutrients, Salinity, Subsoils, Leaching, Land reclamation, *Saline soils, Alkalinity.

In many parts of the world where salinity or alkalinity limit crop yields, leaching is impracticable. In Barbados saline-alkali subsoils remained unproductive 6 years after they were exposed during earth-moving operations. The objective of this study was to devise agronomic techniques to restore these lands to sugar cane production. The effects of mulching and N-K fertilization were studied. Factorial field experiments in which bare plots and plots mulched with cut grass were treated with fertilizer at three rates were carried out at two locations (sandy clay and clay soil respectively). Sugar cane tillers and soil moisture contents were measured weekly, and root development fortnightly. After 9 months of growth bare plots failed to produce any marketable yield in contrast to mulched plots which gave up to 53 metric tons/ha (sandy clay) and 118 tons/ha (clay). There were no responses to fertilizer rate on bare land, but on mulched land 1.2 times (sandy clay) and 2.2 times (clay) more yield resulted from the high compared with the low fertilizer rate. (Skogerboe-Colorado State)
W79-02029

WATER QUALITY CAN AFFECT MANAGEMENT PLANNING,
For primary bibliographic entry see Field 5G
W79-02096

DUAL WATER SUPPLIES: AN IDEA FOR THE FUTURE,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 3D.
W79-02175

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G
W79-02219

PRELIMINARY EVALUATION OF FINAL CUT LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5G.
W79-02292

WASTE WATER RECLAMATION APPARATUS,
For primary bibliographic entry see Field 5D.
W79-02341

3D. Conservation In Domestic and Municipal Use

THE ECONOMICS OF WATER CONSERVATION,
East Bay Municipal Utility District, Oakland, CA.
D. G. Larkin.
Journal of American Water Works Association, Vol. 70, No. 9, 470-473, September 1978. 2 fig, 1 ref.

Descriptors: *Water conservation, *Economics, *East Bay Municipal Utility District(CA), *Costs, *Droughts, *Water management(Applied), *California, Water shortage, Water supply, Public relations, Water rates, Financing, Regulation, Water utilization, Fixed costs, Social aspects, Public utilities.

Response to the 1976-77 California drought by the East Bay Municipal Utility District (EBMUD), serving parts of Alameda and Contra Costa Counties, is described. Water conservation and management efforts consisted of: (1) imposition of 25-35% cutbacks in water use; (2) rate increases to compensate for reduced water sales, including basic $.15/100 cu ft charges and excess use charges; (3) use of $6.8 million in federal drought relief loans and grants; (4) a public information campaign; and (5) retention of the drought surcharge after restrictions were lifted and a further rate increase. Conclusions: (1) most water utility costs do not vary with amount of water sold; (2) when water sales decrease, rates must go up; (3) a permanent decrease in water use of perhaps 15-20% is likely to persist after restrictions are lifted, due to altered customer water-use habits (including water-saving devices and lessened waste); and (4) this permanent decline in water use plus drought-related cost increases will probably require additional rate increases. In the EBMUD case, there was an increase of $3 million in operating costs and $4.5 million in drought-related construction costs, together with a reduction of 66% in net operating revenue in fiscal year 1977. A 33% water rate increase and the federal funds enabled the district to manage until the end of 1977, when another rate increase was necessary. The cutbacks and rate increases were accepted with cooperation and understanding by customers. (Lynch-Wisconsin)
W79-02022

FINANCING SYSTEM CHANGES,
Black and Veatch, Dallas, TX
For primary bibliographic entry see Field 6C.
W79-02023

STRUCTURING WATER UTILITY BOND ISSUES TO COPE WITH INFLATION,
For primary bibliographic entry see Field 6C.
W79-02024

AN ANALYSIS OF NETWORK COSTS: A STUDY OF SYDNEY'S WATER SUPPLY FROM 1890 TO 2001, PART I: RESEARCH METHODS,
Australian National Univ., Canberra. Research School of Social Sciences
For primary bibliographic entry see Field 6B.
W79-02033

URBAN WATER: ACCESS, DELIVERY AND INSTITUTIONAL SCARCITY,
For primary bibliographic entry see Field 6E.
W79-02036

DUAL WATER SUPPLIES: AN IDEA FOR THE FUTURE,
National Water Well Association, Worthington, OH
M. R. Richard.
Water Well Journal, Vol. 30, No. 12, p 64-65, December 1978.

Descriptors: *Water supply, *Dual systems, *Recycling, Water quality, Water management(Applied), Groundwater, Water conservation.

Explored is the concept of dual water supply systems in which high quality water is used for drinking and cooking while lower quality water is used for other purposes. Water supplies can be classified as potable, subpotable, and nonpotable. Potable supplies would be of very high quality. Subpotable supplies might contain trace chemicals but no bacteria. Nonpotable supplies would be recycled wastewater used for irrigation, air conditioning and ground-water recharge. The advantages of dual water systems are: they conserve high quality water; total wastewater discharge and pollution are reduced; they might be cheaper than developing new fresh-water sources or treating large supplies. Dual water supplies can be used in regional water management. Water needs for a city are considered in the light of the quality and amount of available supplies. Examples of industrial, municipal and agricultural dual systems are given. The implementation of dual systems is compatible with increased ground-water development. Ground water is generally of higher quality than surface water and can be developed and treated less expensively. Dual systems are now only feasible for new systems rather than existing ones due to the high cost of redesigning existing pipelines to handle multiple grades of water. (Purdin-NWWA)
W79-02175

MANAGEMENT OF RURAL WATER SUPPLY PEAK FLOW RATES,
Utah Water Research Lab., Logan.
T. C. Hughes
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 104, No. WR1, Proceedings Paper 14148, p 129-137, November 1978. 2 fig, 5 tab, 4 ref.

Descriptors: *Water supply, *Rural areas, *Management, Design, Water distribution, Design standards, Water demand, Domestic water, Peak discharge, Flow, Flow rates, *Utah, *Statistical analysis, Flow restriction devices.

Flow rates in lines serving 4 and 15 families were recorded continuously during two summer peak periods on a low-density rural domestic water system in Utah. During the second summer, the potential flow rates at individual services were cut almost in half (from 11.0 gal/min to 6.3 gal/min average) by installing a small orifice in each service line. Analysis of the flow rate data and interviews with the water users produced conclusions which included the following: (1) Peak demands on this type of system almost never exceed 7 gal/min/service; and, therefore, the customers were essentially unaware of any reduction in the quality of service; (2) Distribution line peak flows were reduced by 7% to 20% by the orifices and could have been reduced much more by a slightly smaller orifice; and (3) Management of peak flows by simple orifices has important potential for sections of systems with marginal distribution line capacities. (Lee-ISWS)
W79-02194

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 6B.
W79-02288

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D
W79-02289

AN ECONOMIC APPROACH TO WATER SUPPLY PLANNING IN SOUTHEASTERN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. VA. Dept. of Agricultural Economics
For primary bibliographic entry see Field 6B
W79-02294

DESIGN AND THE DESERT ENVIRONMENT LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W79-02389

POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering

primary bibliographic entry see Field 5B.
9-02451

. Conservation In Industry

ERSEAS MARKETS FOR THE WATER IN-STRY - NIGERIA,
primary bibliographic entry see Field 5G.
9-02030

TURAL RESOURCES AND REGIONAL DIS-RITIES: A SKEPTICAL VIEW,
primary bibliographic entry see Field 6B.
9-02034

E PRICE OF NATURAL RESOURCES,
primary bibliographic entry see Field 6C.
9-02045

ONOMETRIC ANALYSIS OF ENVIRON-NTAL POLICY: ESTIMATION OF A DEL OF THE CANADIAN PULP AND PER INDUSTRY,
Master Univ., Hamilton (Ontario).
primary bibliographic entry see Field 6B.
9-02046

T TIME TO DO A BENEFIT-COST ANALY- FOR THE LOCATION OF A POWER ANT,
nell Univ. Agricultural Experiment Station, ca, NY. Dept. of Agricultural Economics.
primary bibliographic entry see Field 6B.
9-02054

TURAL RESOURCES AND ENVIRONMEN-L RESTRICTIONS TO GROWTH,
rvard Univ., Cambridge, MA.
primary bibliographic entry see Field 6G.
9-02056

TIMAL AND COMPETITIVE USE OF RE-ENISHABLE NATURAL RESOURCES BY EN ECONOMIES.
elph Univ. (Ontario).
primary bibliographic entry see Field 6C.
9-02058

E CONTROVERSY CONTINUES: STATE NERSHIP OF DRILL RIGS,
iana State Board of Health, Indianapolis.
primary bibliographic entry see Field 6E.
9-02168

PROVED TECHNIQUES FOR EVALUAT-G CARBONATE WATERFLOODS IN WEST XAS,
on Co., Houston, TX.
primary bibliographic entry see Field 4B.
9-02182

SSIBILITY OF RENDERING BLEACHERY FLUENTS HARMLESS BY TECHNOLOGI-L CHANGES (UEBER DIE MOEGLICHKEIT EICHEREIABWAESSER DURCH TECHNO-GISCHE AENDERUNGEN UNSCHAED-CH ZU MACHEN),
skumny Ustav Papieru a Celulozy Bratislava echoslovakia). Forschungsinstitut fuer Zellstoff d Papier.
primary bibliographic entry see Field 5G.
9-02360

. Conservation In Agriculture

MONIUM EFFECTS ON NUTRIENT TION ABSORPTION BY WHEAT,
stern Australia Dept. of Agriculture, South th.
J. Cox, and H. M. Reisenauer.
Agronomy Journal, Vol. 69, No. 5, p 868-871, September-October 1977. 1 fig, 3 tab, 18 ref.

Descriptors: *Nutrients, Fertilizers, Fertilization, *Cations, *Absorption, *Wheat, Nitrogen, Potassium, Calcium, Zinc, Magnesium, Manganese.

Additions of small amounts of NH4 to adequate (-)N03 culture have been shown to increase crop yield and total N content, and to decrease the plant's content of metal cations. The magnitudes of these effects can be appreciable. Accordingly, experiments were done to elucidate their mechanisms, and to evaluate their roles in crop production. Wheat was grown in the greenhouse in dilute constant-composition cultures that supplied, in factorial combination, three levels of NH4 with four levels ofeither K, Ca, Mg, Mn, or Zn. Intake of mineral cations increased with the concentration of the ion in solution and was decreased by added NH4. (Skogerboe-Colorado State)
W79-02021

GROWTH AND YIELD OF SPRING WHEAT AS INFLUENCED BY SHELTER AND SOIL WATER,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
A. B. Frank, D. G. Harris, and W. O. Willis.
Agronomy Journal, Vol. 69, No 6, p 903-906, November-December 1977. 1 fig, 6 tab, 20 ref.

Descriptors: *Windbreaks, *Wheat, Irrigation, Irrigation effects, *Crop production, Crop response, *Soil water, Wind velocity, Leaves.

In the Northern Great Plains, windbreaks have historicaly been used to protect crops and soils from winds, but data on the effects of windbreaks on growth and yield of small grains is limited. 'Waldron' wheat was grown on Parshall fine sandy loam with and without shelter (slat-fence enclosures), both with and without irrigation, to determine the effects of soil water and shelter on wheat growth and yield. In 1973 and 1974, plant height, tiller production, leaf area index, specific leaf weight, and dry matter were measured at tillering, heading, and grain-filling growth stages. Also, grain yield, kernel weight, number of heads, straw yield, and plant height were measured at crop maturity. (Skogerboe-Colorado State)
W79-02035

ISSUES IN WATER DEVELOPMENT DECISIONS: A DISCUSSION PAPER,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6B.
W79-02042

PLANT WATER RELATIONSHIPS OF SPRING WHEAT AS INFLUENCED BY SHELTER AND SOIL WATER,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
A. B. Frank, D. G. Harris, and W. O. Willis.
Agronomy Journal, Vol 69, No 6, p 906-910, November-December 1977. 6 fig, 1 tab, 19 ref.

Descriptors: Micro environment, *Windbreaks, *Wheat, Irrigation, Irrigation effects, *Crop production, Crop response, *Soil water, Wind velocity, Leaves.

Field windbreaks have been planted primarily for soil erosion control; subsequently, research has shown that windbreaks have an effect on microclimate and on growth and yield of crops. Other research has shown that plant water relations respond to changes in microclimates. The present work was undertaken to determine the effect of microclimate changes induced by a slat-fence windbreak on the plant water relations of field-grown wheat. Slat-fence barriers were used as windbreaks for studying effects of shelter-modified microclimate on plant water relations of 'Waldron' spring wheat, grown on Parshall fine sandy loam under irrigated and dryland soil water regimes. Data were collected on leaf water potential, xylem water potential, stomatal diffusion resistance, canopy temperature, soil water potential, soil water extraction, and grain yield. (Skogerboe-Colorado State)
W79-02043

WATER UTILIZATION AND REALLOCATION IN CHILE: A STUDY OF THE PIRQUE VALLEY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02053

TILLAGE EFFECTS ON WINTER WHEAT PRODUCTION WHERE THE IRRIGATED AND DRYLAND CROPS ARE ALTERNATED,
P. W. Unger.
Agronomy Journal Vol. 69, No. 6, p 944-950, November-December 1977. 2 fig, 5 tab, 11 ref.

Descriptors: *Wheat, Irrigation, *Irrigation effects, *Crop production, *Cultivation, Crop response, Soil water, Soil moisture, Irrigation efficiency, Dry farming.

While adequately irrigated winter wheat yields are relatively high, dryland wheat yields in the southern Great Plains are only about 700 kg/ha with continuous cropping and about 1,000 kg/ha on a harvested area basis after fallow. This study was conducted to determine if yields could be increased where irrigated and dryland wheat crops are alternated on the same plots. Tillage effects were also studied. (Skogerboe-Colorado State)
W79-02088

DRIP STUDY SHOWS UP TO 30% WATER SAVINGS,
J. Schleicher.
Irrigation Age, Vol. 11, No. 4, p 37, 69, January, 1977. 1 fig.

Descriptors: Irrigation, Irrigation practice, Irrigation systems, *Irrigation efficiency, *Orchards, Crop production, *Water conservation, *Drip irrigation.

Tree crop farmers repeatedly hear how efficient drip irrigation is in relation to either sprinkler or furrow water application methods. But just how does 'drip efficiency' stack up in terms of comparative water savings with sprinkler and furrow techniques That question is the subject of a joint research project currently being sponsored by the University of California and the California Department of Water Resources on citrus farm near Parlier, California. The study centers around a 40-acres block of 8-year-old Navel oranges, chosen for the uniformity of soil, water and tree conditons. The acreage is divided into 12 five-row blocks permitting the researchers to create four replications each of the three irrigation methods. (Skogerboe-Colordo State)
W79-02090

MAKING THE DESERT FLOWER: IRRIGATING CALIFORNIA'S IMPERIAL VALLEY,
R. Mallory.
Irrigation Journal, Vol 27, No 5, p 19-20, 27, September-October, 1977, 2 fig.

Descriptors: *California, Water conservation, Water quality, *Crop production, Salinity, Saline soils, Furrow irrigation, *Imperial Valley(Calif).

'Making the desert flower' is a description heard many times in the irrigated farmlands of the West. But perhaps nowhere is the description more appropriate than in California's Imperial Valley. With less than three inches of rain per year in this southern-most California Valley, the land could not even be initiated into dryland wheat production as was much of the rest of the state. (Skogerboe-Colorado State)
W79-02092

CALCULATING THE COST OF EACH IRRIGATION,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
L. New.
Irrigation Age, Vol 11, No 9, p 56-57, July-August, 1977. 2 tab.

Descriptors: Irrigation, *Irrigation practices, Irrigation efficiency, Pumping, Economics, *Costs.

In view of today's energy costs, excessive irrigation amounts and poor field distribution patterns can seriously damage the profitability of a farming enterprise. You may have a good idea of your total pumping time, and your annual fuel costs per acre of land. But the best lead to your irrigation efficiency is to know how much water is pumped, and where it's going. You can obtain those figures by knowing your irrigation well capacity and the number of hours that a well or group of wells are pumped to irrigate a specific acreage. The specific acreage can be an irrigation set, a section of land, a field of corn, or even the actual acreage irrigated by a center pivot sprinkler. (Skogerboe-Colorado State)
W79-02094

CONTROLLING SEDIMENT IN SURFACE RUNOFF,
Agricultural Research Service, Kimberly ID. Snake River Conservation Research Center.
A. Humphreys.
Irrigation Age, Vol. 12, No. 1, p 22, 24, September, 1977. 1 fig.

Descriptors: *Sediments, Nutrients, Runoff, *Irrigation effects, Pesticides, Fertilizers, Salts, *Sediment control.

Irrigators are sometimes criticized for contaminating downstream waters with sediment, nutrient and pesticides contained in surface runoff from irrigation. Research studies have shown that the concentrations of dissolved fertilizer nutrients, pesticides and salts in surface runoff are essentially the same as those in the applied irrigation water. Thus, water passing over the soil surface does not usually pick up additional amounts of these materials. Significant increases in nutrient or pesticide concentration do occur when these materials are applied by adding them to the irrigation water or when the material falls into the water from spray application or is washed from the plants by rain. When fertigation and herbigation are practiced, runoff water should be retained in a reuse pond and not allowed to leave the farm or flow into natural streams. (Skogerboe-Colorado State)
W79-02097

ZINC NUTRITION OF RICE AS INFLUENCED BY RATES OF GYPSUM AND ZN FERTILIZATON OF ALKALI SOILS,
Punjab Agriculture Univ., Ludhiana. Dept. of Soils.
P. N. Takkar, and T. Singh.
Agronomy Journal, Vol. 70, No. 3, p 447-450, May-June, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: *Rice, Nutrient requirements, *Zinc, *Gypsum, Alkaline soils, *Fertilization, Reclamation, Crop response, Submerged plants, *Calcium.

Three field experiments were conducted on Zn deficient alkali soils, two on Natraquic calciorthids, and one on Aquic Camborthids, to determine the effect of gypsum and Zn fertilization alone and in combination on the Zn nutrition of rice IR 8. Three rates of gypsum and three rates of Zn and their possible combinations were tried. At all the three locations, the growth of the rice crop was very poor and exhibited Zn deficiency symptoms in control plots. The yield and Zn uptake was higher in alkali soil high in CaCO3 and low in pH than in soils low in CaCO3 and high in pH. Gypsum application markedly decreased the soil pH, and significantly increased the yield and Zn uptake by rice. Zinc application decreased the pH, but not so appreciably as did gypsum; and markedly increased the available Zn from deficient to adequate levels. Optimum response of rice to Zn was observed at 11.2 kg Zn/ha except in one of the Natraquic calciorthids where it was 22.4 kg Zn/ha. The beneficial effect of Zn application to rice grown on the alkali soils under investigation was far more than that of gypsum. (Skogerboe-Colorado State)
W79-02099

LAWN SPRINKLER DISTRIBUTION PATTERNS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
G. L. Kerr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 698, Price codes: A05 in paper copy, A01 in microfiche. M. S. Thesis, May 1978. 72 p, 16 fig, 7 tab, 8 ref, 2 append. OWRT B-035-WYO(1), 14-34-0001-7201.

Descriptors: *Sprinkler irrigation, *Lawns, *Distribution patterns, *Wyoming, *Application rates, *Christiansen's Uniformity Coefficient.

Distribution patterns of six typical lawn sprinkler types were determined during the summer of 1977. Tests were conducted on four sprinklers from each type under three pressure levels. Christiansen's Uniformity Coefficient (UCC) was calculated for the original pattern and for each of nine different overlaps of the sprinklers. Overlaps required to achieve minimum acceptable UCC values were then determined. The output of each sprinkler was measured and application rates were calculated for individual pattern sizes at the three pressure levels. Two important factors for effective lawn watering include: (1) usage of the proper overlap for an individual sprinkler type, and (2) determination of the application rate in order to apply the proper amount of water for a given soil type
W79-02155

HIGH PLANS - OGALLALA GROUNDWATER STUDIES,
Kansas Water Resources Board, Topeka
For primary bibliographic entry see Field 4B.
W79-02172

RECIPROCABLE SPRINKLER,
G. Brandl.
U.S. Patent No. 4,109,866, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2197, August 29, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Application equipment, Water delivery.

A sprinkler designed to irrigate a certain sector of the ground comprises an upward sloping barrel which rotates about a vertical axis and which terminates in a nozzle. It carries two vertically oscillatable arms that are alternately effective to drive the barrel on a forward swing and on a return swing under the impact of the emitted water spray. The reverse-driving arm has a deflecting head which, on the return swing, lies in line with the nozzle and has two hands adjoining each other at an obtuse angle, i.e. a ramp face sloping upward in a radially outward direction and a reaction face of larger area including an acute horizontal angle with the radial direction. When the head is lowered into the path of the spray by an end stop, the impact of the water upon the ramp face pulls the reaction face into line with the nozzle against the force of a restoring spring. Another such spring, including a lost-motion connection, goes into effect in a position in which the spray impinges squarely upon the reaction face, thus tending to hold that face aligned with the nozzle but allowing the head to yield under excessive water pressure. (Sinha-OEIS)
W79-02318

THE MICRO-CLIMATE OF NARROW- AND WIDE-ROW SORGHUM WITH EQUAL PLANT DENSITIES,
Kansas State Univ., Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2D.
W79-02358

WIND, SPRINKLER PATTERNS, AND SYSTEM DESIGN,
Technion-Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering
I. Seginer, and M. Kostrinsky.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 101, No. IR4, p 251-264, December 1975. 8 fig, 3 tab, 6 ref.

Descriptors: *Sprinkler irrigation, *Wind velocity, *Irrigation, *Irrigation design, *Irrigation efficiency, *Distribution patterns.

The study concludes that: (1) Due to the fact that wind speed and solar radiation were not correlated in the data on which this study was based, it was possible to show that the wind speed was not directly contributing to the water loss during sprinkling. (2) A method of sprinkler patterns reconstruction was developed, which yielded representative interpolated patterns, as well as reliable extrapolated patterns for no-wind conditions. (3) It was theorized and demonstrated that when the centers-of-mass of consecutive distribution patterns are equidistant, the water distribution is likely to be the optimal that can be achieved under the major constraints of the system. (Skogerboe-Colo St)
W79-02368

DIFFERENTIAL EFFECT OF BERMUDA AND BAHIAGRASSES ON SOIL CHEMICAL CHARACTERISTICS,
Georgia Univ., Athens. Dept. of Agronomy
K. H. Tan, E. R. Beaty, R. A. McCreery, and J. B. Jones.
Agronomy Journal, Vol. 67, No. 3, p 407-411, May-June, 1975. 5 fig, 2 tab, 20 ref.

Descriptors: *Grasses, *Forage grasses, Forages, *Organic matter, Crop response, *Soil chemical properties, Soil chemistry, Nitrogen, Fertilization, *Bermudagrass, *Bahiagrass.

The use of bermudagrass and bahiagrass has attracted considerable research attention with respect to forage production. Little information is available on the influence of these grasses on soil properties; and a direct comparison to effectively estimate the differential effect of bermudagrass and bahiagrass on major soil chemical properties is still lacking. A randomized split plot experiment was carried out in three replicates using a Montevalo soil planted with several bermudagrass and bahiagrass varieties, receiving annual application of 0, 224, and 672 kg N per ha from 1967 to 1970. In 1971 herbage and soil samples were collected for yield and chemical analysis. The results indicated the absence of differences in the effects of the grasses on soil pH, N, P, K, and Ca, but there were differences in organic matter contents. (Skogerboe-Colo St)
W79-02381

DESALINATION IN THE REUSE OF INDUSTRIAL WASTE WATER.
Water Reuse Promotion Center, Tokyo (Japan)
For primary bibliographic entry see Field 5D.
W79-02383

ADVECTION MODIFICATION OF THE PRIESTLEY AND TAYLOR EVAPOTRANSPIRATION FORMULA.
Wisconsin Univ.-Madison. Dept. of Soil Science
For primary bibliographic entry see Field 2D.
W79-02395

YIELD OF DRYLAND GRAIN SORGHUM AS AFFECTED BY ANTITRANSPIRANT, NITROGEN, AND CONTRIBUTING MICRO-WATERSHED.
New Mexico Agricultural Experiment Station, University Park
H. D. Fuehring

Agronomy Journal, Vol. 67, No. 2, p 255-257, March-April, 1975. 3 tab, 11 ref. OWRT B-029-NMEX(1).

Descriptors: *Antitranspirants, *Rain water, Surface runoff, *Drought, *Moisture stress, Sorghum, Nitrogen, Watershed management, Fertilizers, *Atroazine, Rain-water efficiency, Micro-Watersheds.

In the semi-arid Great Plains yields of grain sorghum (Sorghum bicolor(L.) Moench) are always limited by lack of rainfall or soil moisture during some part of the growing season. The purpose of this study was to determine if minimal land shaping practices in combination with antitranspirant application would increase yield levels of dryland grain sorghum. Variables were width of watershed, width of growing bed, applied N, and foliarly applied antitranspirant combined in a central composite experimental design. Use of contoured compacted bare micro-watersheds increased grain sorghum yields of adjacent growing beds considerably even in two relatively wet years. However, yields of the entire area (growing bed plus watershed) decreased. Atrazine (2-chlor-ethylamino-6-isopropylamino-s-triazine) as an antitranspirant at 0.2 to 0.3 kg/ha effectively increased sorghum grain yields under conditions of solid planting and adequate nitrogen. The antitranspirant-nitrogen interaction was especially positive under conditions of moisture stress. Since most grain sorghum is grown under conditions where moisture stress is likely, further work on the use of antitranspirant is warrented in order to establish the conditions of response.
W79-02403

PHYSIOLOGICAL ASPECTS OF WATER USE EFFICIENCY,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W79-02449

YIELD RESPONSE TO SOIL WARMING: AGRONOMIC CROPS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
K. A. Rykbost, L. Boersma, H. J. Mack, and W. E. Schmisseur.
Agronomy Journal, Vol 67, p 733-743, Nov-Dec 1975. 7 fig, 2 tab, 9 ref. OWRT B-039-ORE(5) and B-044-ORE(2).

Descriptors: Reject energy, *Soil temperature, *Crop response, Cooling water, Heated water, *Waste heat.

Waste heat appears in the form of warm condenser cooling water from power generating plants. It has been proposed to use this water with temperatures ranging from 25 to 40C for warming soils by pumping it through buried pipes. Experiments were conducted to determine the effect of warming soils in this manner on the growth rates and yields of several crops. The proposed system was simulated with parallel electrical heating cables buried 92 cm deep and 183 cm apart. Heat source temperatures ranged from 35 to 38C during the growing period. Heating increased the average temperature of the soil layer from 0 to 100 cm deep by about 10C. The average temperature increase of the 0 to 10 cm soil layer was < 3C. The crops tested were field corn (Zea mays L.), sudangrass (Sorghum vulgare sudanese), sughum-sudangrass hybrid (Sorghum bicolor L.), and tall fescue (Festuca arundinacea). The yield increases, expressed as percentages of yields obtained on unheated plots, ranged from 19% for tall fescue to about 50% for sudangrass. The yield increases varied widely from year to year for the same crop. The highest yield increases occurred during years when the yields on unheated plots were lowest. Correlations between yield increases and yields from unheated plots were highly significant. A yield decrease occurred only with tall fescue during the summer. Soil heating appears to be most effective when climatic conditions and management factors are limiting. The effects of higher soil temperatures on growth rates were greatest in the early spring.
W79-02490

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE EFFECTS OF WEED-CUTTING ON THE MACRO-INVERTERATE FAUNA OF A CANALISED SECTION OF THE RIVER HULL, A NORTHERN ENGLISH CHALK STREAM,
James Cook Univ. of North Queensland, Townville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02002

AQUATIC PLANT MANAGEMENT IN SEMI-NATURAL STREAMS: THE ROLE OF MARGINAL VEGETATION,
Freshwater Biological Association, East Stoke (England). River Lab.
For primary bibliographic entry see Field 5G.
W79-02012

THE ECONOMICS OF WATER CONSERVATION,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 3D.
W79-02022

STUDYING THE ECONOMICS OF A WATERWAY: A CRITIQUE OF STUDIES OF THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02052

THE OCCURRENCE AND REMOVAL OF NITROGEN IN SUBSURFACE AGRICULTURAL DRAINAGE FROM THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W79-02107

FORESTED WETLANDS OF FLORIDA-THEIR MANAGEMENT AND USE,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 6B.
W79-02112

SOME COMPARISONS OF FLOOD STATISTICS IN REAL AND LOG SPACE,
Geological Survey, Reston, VA. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
For primary bibliographic entry see Field 2E.
W79-02119

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02121

FLOW CHARACTERISTICS OF STREAMS IN TUTUILA, AMERICAN SAMOA,
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02124

ESTIMATES OF 7-DAY, 10-YEAR MINIMUM FLOWS AT SELECTED STREAM SITES IN PUERTO RICO,
Geological Survey, San Juan, PR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02125

MAGNITUDE AND FREQUENCY OF FLOODING ON THE MYAKKA RIVER, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, FL., Water Resources Div.
K. M. Hammett, J. F. Turner, Jr., and W. R. Murphy, Jr.
Water-Resources Investigations 78-65 (open-file report), 1978. 40 p, 15 fig, 8 tab, 11 ref.

Descriptors: *Flood plains, *River basin development, *Watershed management, *Flood control, *Flood profiles, Flood peak, Flood frequency, Flood routing, Dikes, Flood forecasting, Analytical techniques, *Florida, *Myakka River basin(FL), Sarasota County, Manatee County.

Increasing numbers of urban and agricultural developments are being located on waterfront property in the Myakka River flood plain in southwest Florida. Under natural conditions, a large depression, Tatum Sawgrass, was available as a flood storage area in the upper Myakka River basin. Construction of dikes across the lower part of Tatum Sawgrass has restricted use of the depression for temporary storage of Myakka River flood water overflow, and has resulted in increased flood-peak discharges and flood heights in downstream reaches of the Myakka River. The difference between natural and diked condition flood-peak discharges and flood heights is presented to illustrate the effects of the dikes. Flood-peak discharges, water-surface elevations and flood profiles also are provided for diked conditions. Analytical procedures used to evaluate diking effects are described in detail. The study reach includes Myakka River main stem upstream from U.S. Highway 41, near Myakka Shores in Sarasota County, to State Road 70 near Myakka City in Manatee County (including Tatum Sawgrass and Clay Gully), and Blackburn Canal from Venice By-Way to Myakka River. (Woodard-USGS)
W79-02129

FLOOD-PLAIN DELINEATION FOR CUB RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02137

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA., Water Resources Div.

For primary bibliographic entry see Field 7C.
W79-02141

INCREASING EFFICIENCY OF AQUATIC PLANT MANAGEMENT THROUGH PROCESSING,
Wisconsin Univ.-Madison. Water Resources Center.
R. G. Koegel, S. H. Sy, H. D. Bruhn, and D. F. Livermore.
Hyacinth Control Journal Vol. 11, p. 24-30, June 1973. 9 fig, 3 tab, 13 ref. OWRT B-058-WIS(2), 14-31-0001-3665.

Descriptors: *Harvesting, *Aquatic weed control, *Mulching, *Mechanical equipment, *Treatment, Feed, *Wisconsin, Dane County(Wis).

While mechanical harvesting is generally considered an ecologically sound approach to the control of excessive aquatic plant growth, its application has been limited by high unit costs. The efficiency of mechanical harvesting can be greatly increased by (1) reducing the weight, (2) reducing the volume, and (3) improving the handling characteristics of the harvested plant material by means of processing. Possibilities for utilization and disposal of harvested aquatic plants are also dicussed.
W79-02158

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Lower Mississippi Valley Div.
R. I. Kaufman.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 104, No. WR1, Proceedings Paper 14169, p 105-121, November 1978. 4 fig, 1 tab, 4 ref.

Descriptors: *Mississippi River, *Floods, *Illinois, *Gulf of Mexico, Flood control, Hydraulics, Levees, Rivers, Seepage, Waves(Water), Flood damage, *Mississippi River flood, Flood control plan.

In 1973 a major flood occurred on the Mississippi River. Much of the alluvial valley of the river between Alton, Illinois, and the Gulf of Mexico is protected against floods by Federally constructed flood control works. As some of these systems were not complete at the onset of the flood, a major flood fight was required to safeguard the valley. Miles of levee had to be raised to provide proper protection. Other problems requiring flood-fight efforts were seepage under levees, scour at levees and structures, and riverbank failures. Even though major emergency efforts were required, the Federal flood control systems were effective and of great value in controlling the flood. The projects prevented the inundation of 26,000 sq miles (67,500 sq km) of land and reduced flood damages by over $14,000,000,000. However, the losses sustained indicate the need to complete authorized works and possibly expand existing projects or initiate new projects in some areas, or both. (Lee-ISWS)
W79-02195

FORECAST OF THE FLASH FLOOD HYDROGRAPH ON THE INGODA RIVER,
V. A. Bel'chikov.
Soviet Hydrology: Selected Papers, Vol 16, No 1, p 21-25, 1977. 3 fig, 2 tab, 6 ref. Translated from Transactions of the Hydrometeorological Scientific Research Center of the USSR (Trudy GMTs), No. 183, p 56-65, 1977.

Descriptors: *Flood forecasting, *Flash floods, *Hydrograph analysis, *Mathematical models, Runoff forecasting, Water levels, Rivers, Hydrographs, Rainfall-runoff relationships, Infiltration, Evaporation, Foreign research, Foreign countries, Analytical techniques, Precipitation(Atmospheric), Discharge(Water), Floods, *USSR, *Ingoda River(USSR).

The results of the use of a mathematical model of flash flood formation in developing a method of short-range forecasting the runoff hydrograph for the Ingoda River basin (upstream of Chita city) were reported. The mountain topography, relatively steep slopes, and a developed river network promote the rapid discharge of rainwaters into the main channel network and the formation of high floods. Flash floods with brief and sharp rises and drops in level are fairly frequent. Data on discharges, precipitation, and the atmospheric moisture deficit for the period from 1952 to 1971 were used to develop a method of short-range flash flood forecasting. Since operational information contains only stage data, discharge curves were used. An estimate of the control forecasts lead to the conclusion that the developed model can be used by means of a computer to issue continuous short-range forecasts of flash flood discharges 36 hours in advance. Computations on the basis of observations in the Ingoda reach in question from 1952 to 1971 showed that the computed and actual discharges agreed very well. (Humphreys-ISWS)
W79-02207

COMPLEX RELATIONS BETWEEN THE HYDROLOGIC BUDGET OF THE MAJOR GEOGRAPHIC ZONES OF THE EARTH,
Akademiya Nauk SSSR, Moscow. Inst. Geografii
For primary bibliographic entry see Field 2A.
W79-02208

GEOGRAPHIC ASPECTS OF THE TERRITORIAL REDISTRIBUTION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Inst. of Geografii.
M. I. L'vovich.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 38-47, 1977. 3 fig, 1 tab. Translated from News of the USSR Academy of Sciences, Geographic Series (Izvestiya Akad. nauk SSSR. Ser. geogr.), No. 2, p 22-37, 1977.

Descriptors: *Water resources development, *Planning, *Water transfer, *Inter-basin transfer, Diversion, Spatial distribution, Geographical regions, Runoff, Rivers, Withdrawal, Water quality, Reservoirs, Water importing, Foreign countries, *USSR.

The principles of a scientific concept developed under the guidance of the author and reported at the Scientific Council of the Institute of Geography, USSR Academy of Sciences, were described. The general scientific and economic permises of the redistribution of water resources in the USSR, including some alternatives, were analyzed. The experience gained in the construction of one of the largest hydraulic engineering complexes, the Volga-Kama cascade of reservoirs, was discussed. General considerations were presented on the need and possibilities of using additional freshwater in southern regions in relation to the prospects for their development. Particular attention was given to the intensification of water management and to water quality, and the geographic aspects of investigations in this field were outlined. (Humphreys-ISWS)
W79-02209

MECHANISM OF FORMATION AND FORECAST OF THE DEVELOPMENT OF THE VOLGA DELTA,
For primary bibliographic entry see Field 2J.
W79-02210

SEICHES IN THE BALTIC SEA AND THEIR EFFECT ON FLOODS IN THE NEVA RIVER DELTA,
For primary bibliographic entry see Field 2L.
W79-02213

THE COLONIZATION OF CABORA BASSA, MOCAMBIQUE, A NEW MAN-MADE LAKE, BY FLOATING AQUATIC MACROPHYTES,
Loxton, Hunting and Associates, Gaberone (Botswana).
W. J. Bond, and M. G. Roberts.
Hydrobiologia, Vol. 60, No. 3, p 243-259, 1978. 5 fig, 7 tab, 23 ref.

Descriptors: *Lake Cabora Bassa(Mocambique), *Impoundments, *Floating plants, *Aquatic weed control, *Water hyacinth, *Salvinia molesta, Vegetation establishment, Mozambique, Lakes, Artificial lakes, Eichhornia crassipes, Drawdown, Nutrients, Eutrophication, Water pollution effects, Lake Kariba(Mocambique), Zambezi River, Limiting factors, Succession, Pistia stratiotes, Hydroelectric plants, Multiple-purpose projects, Macrophytes, Pesticides, Mechanical control, Insects.

Predicted extensive macrophyte growth by the floating weeds Salvinia molesta and Eichhornia crassipes (water hyacinth) during filling of Lake Cabora Bassa (Mocambique), a new impoundment of the Zambezi River, had not occurred by the end of 1975. Filling begun in December 1974, was very rapid and surface currents carried large quantities of weed to the outflow at the lake's eastern end. When lake levels stabilized, macrophytes were concentrated in the extreme east and west, with scattered mats on northern shores of the central basins. The Carinde narrows at the western end impeded weed passage, particularly after surface currents ceased and easterly winds dominated plant dispersal. Storm-related winds at the end of the year led to some redistribution of the largely stable mats. Not more than 1% of the surface area was ever covered by floating macrophytes. Initially, Salvinia, Eichhornia, and Pistia stratiotes were present in large quantities, then Salvinia was rapidly suppressed by Pistia, and then both species by Eichhornia, which was completely dominant by the end of the year. Eichhornia grew rapidly until September when rates diminished, and in Gorge Basin signs of nutrient deficiency developed. By the end of 1975 no offsets were being produced by Eichhornia for unknown reasons. Rapid drawdown in july 1975 destroyed nearly 50% of the weed mats, and two insects may have helped control populations. Harvesting and pesticides eliminated weeds in the central basins and parts of the Gorge Basin. Results are contrasted with Lake Kariba. (Lynch-Wisconsin)
W79-02231

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-02289

PROFILE AND MEASUREMENT OF SOCIAL WELL-BEING INDICATORS FOR USE IN THE EVALUATION OF WATER AND RELATED LAND MANAGEMENT PLANNING,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 6B.
W79-02344

REMOTE SENSING TECHNIQUES AND THE MONITORING OF DESERTIFICATION PROCESSES IN ARID AREAS,
Desert Inst. Ashkhabad (USSR)
For primary bibliographic entry see Field 7B.
W79-02390

ESTABLISHMENT OF NATIVE PLANTS FOR THE REHABILITATION OF PARAHO PROCESSED OIL SHALE IN AN ARID ENVIRONMENT,
Utah State Univ., Logan. Inst. for Land Rehabilitation
C. M. McKell
In: The Reclamation of Disturbed Arid Lands, ed. by R. A. Wright University of New Mexico Press, Albuquerque, p 13-32, 1978. 1 tab, 2 fig, 55 ref.

Descriptors: *Oil shales, *Revegetation, *Baseline studies, *Land reclamation, Infiltration, Rainfall-runoff relationships, Water yield, Range manage-

ment, Soil surfaces, Rocky Mountain region, Vegetation establishment, Soil stabilization.

Oil shale deposits, a large potential energy source, are found in Colorado, Utah, and Wyoming. Although their exploitation has yet to reach commercial stage, government officials, in anticipation, have begun to develop techniques for the rehabilitation of areas disturbed by such exploitation. Accordingly, 5000-acre tracts of Federal land in Utah and Colorado were leased for prototype oil shale development. A baseline data gathering program began in 1975 on these tracts and has subsequently identified many potential problems. In the Uinta Basin in northeastern Utah and to set forth techniques suitable for the establishment of native shrubs in these areas. Basic components include: (1) use of native plant species, (2) transplanting container-grown plants to avoid direct seeding, (3) soil surface shaping to induce runoff and terraces to increase infiltration, (4) soil surface stabilization to promote runoff and reduce soil particle movement, (5) topsoil use limited to trenches where plants can be grown, (6) fertilizer application only in required amounts, and (7) supplemental irrigation. Actual operation may require modification of these techniques. (Tickes-Arizona)
W79-02391

A HYDRAULIC INSTALLATION IN THE WATER SUPPLY SYSTEM OF EMMAUS-NICOPOLIS,
Hebrew Univ., Jerusalem (Israel).
Y. Hirschfeld.
Israeli Exploration Journal, Vol 28, No 1-2, p 86-92, 1978. 4 fig, 17 ref.

Descriptors: *Aqueducts, *Paleohydrology, *History, *Conveyance structures, Dating, Water resources development, Archaeology, Diversion structures, Hydrologic aspects, Structural analysis, Adaptation, Architecture, Masonry, Israel.

The construction and operation of the recently excavated water supply system of the ancient Roman city of Emmaus is described. The system is composed of sophisticated installations for groundwater collection, including two parallel aqueducts built on two separate sources of water: the upper is a masonry tunnel approximately 25 meters long, penetrating horizontally and collecting the water at ground level. The tunnel, .30 m wide and 1.20 m high is built of ashlar and contains two inspection shafts; the lower channel runs from a stone craft which penetrates vertically to the groundwater, an example of a subterranean artificial spring feeding a water supply system. This aqueduct, built completely underground, is composed of three elements: an artificial spring, a vaulted room that protects it, and an approach shaft from the surface. Based on archeological and historical evidence, it is assumed that this hydraulic installation was constructed in the fifth century A.D. Systems similar to this one have been uncovered in several eastern Roman cities dating from the third to the fifth centuries A.D. Architecturally, these systems are characteristic of Roman construction in the eastern parts of the empire and utilize the ashlar masonry technique. (Tickes-Arizona)
W79-02394

THE WATER SUPPLY SYSTEM OF CAESAREA MARITIMA,
For primary bibliographic entry see Field 8B.
W79-02399

EVALUATION MODELS FOR PUBLIC MANAGEMENT OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6B.
W79-02401

IDENTIFICATION AND DELINEATION OF FRESHWATER WETLAND VALUES,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6B.
W79-02402

WETLAND ROAD CROSSING: DRAINAGE PROBLEMS AND TIMBER DAMAGE,
Forest Service (USDA), St. Paul MN. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W79-02421

STOCHASTIC MODELING FOR PREDICTING FREQUENCY DISTRIBUTION OF STAGES IN THERMAL LAKES AT FUTURE PLANNING HORIZONS,
Utah Water Research Lab., Logan.
L. D. James, D. S. Bowles, and S. J. Burges.
In: Desertic Terminal Lakes, Proceedings of the International Conference on Desertic Terminal Lakes. Weber State College, Ogden, Utah, Deon C. Greer, Ed. Utah Water Research Lab. Publication. Sept 1977. OWRT B-153-UTAH(1), 14-34-0001-8122.

Descriptors: *Stochastic models, *Frequency distribution, *Lake stages, Planning, *Forecasting, Model studies, Land use, *Desertic terminal lakes.

Planners and engineers responsible for dealing with fluctuating terminal-lake water levels in planning land use along terminal-lake shorelines, or for water resources management in terminal-lake basins need information on stage-frequency and how it is affected by their plans. Comparison of the alternative methods for deriving the needed relationships finds stochastic modeling (operational hydrology) techniques superior. The method (1) develops a stochastic model that preserves the distributional and persistence properties of the historical sequences of surface inflow, groundwater inflow, precipitation on the lake, and evapotranspiration, (2) inputs generated sets of these four sequences to a water balance model to estimate corresponding sequences of lake stage commencing at the known present lake level, and (3) analyzes these sequences to establish lake stage-frequency distributions at each year to some planning horizon. By using rainfall-runoff relationships to adjust inflows, and method estimates how variations in land and water use in the tributary basin affect lake stage.
W79-02495

4B. Groundwater Management

PUBLIC GROUNDWATER SUPPLIES IN KANE COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 617, Price codes: A05 in paper copy, A01 in microfiche. ISWS Bulletin 60-22, 1978. 92 p, 3 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, Unconsolidated aquifers, Well data, Gravels, Sand aquifers, Bedrock, Sandstones, Dolomite, Groundwater availability, Groundwater, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers, *Kane County(Ill), Dissolved minerals, Water bearing formations.

All available information on production wells used for public water supplies in Kane County, Illinois, was presented. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. The report included separate descriptions for 34 public water supply systems furnishing water to 16 municipalities, 14 subdivisions, and 4 state institutions in Kane County. These were preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for public use. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer or aquifers tapped, data drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses.(Humphreys-ISWS)
W79-02075

GEOLOGY AND GROUNDWATER RESOURCES OF NORTHERN BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02132

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02133

MAJOR AQUIFERS IN CLARK COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02134

POTENTIAL FOR DOWNWARD LEAKAGE TO THE FLORIDAN AQUIFER, GREEN SWAMP AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02136

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA., Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02141

GEOPHYSICAL DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN GRUNDY COUNTY, MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-02154

TWO DRILLING METHODS COMPARED,
Schultes (A. C.) and Sons, Inc., Woodbury, NJ.
For primary bibliographic entry see Field 8B.
W79-02169

HIGH PLANS - OGALLALA GROUNDWATER STUDIES,
Kansas Water Resources Board, Topeka.

J. A. Power, Jr.
(1978) Kansas Water News, Vol. 21, No. 1 and 2, p 4, 46-47.

Descriptors: *Aquifer management, *Groundwater, Investigations, *Model studies, Evaluation, Management, Computer models, Oil, Water supply, Overdraft.

The Ogallala - High Plains economy is being threatened by lowering of the water table and declining petroleum production. Economic disaster can be averted by regional investigations. The Economic Development Administration - High Plains Council Study is a multi-agency, six-state study of the declining water resources of the Ogallala. Its objectives are: (1) determine development alternatives; (2) identify and describe policies and actions for carrying out development strategies, and (3) evaluate local, state and national implications of these alternative development strategies. The U.S. Geological Survey-Ogallala Study is a four-year study of the High Plains aquifer system. Its objectives are to: (1) Describe the quantity and quality of water resource and the hydrologic budget; (2) Develop a regional water resources data storage and retrieval system; (3) Develop data collection networks to monitor future water use, water quality changes and water storage changes; (4) Design and develop digital computer models of the aquifer system; (5) Demonstrate the applicability of the models and provide a hydrologic basis for the economic evaluation of management alternatives. Computer models of the High Plains aquifer system will predict the future state of the system with a given knowledge of future stress. They will be a vital tool in groundwater management. (Purdin-NWWA)
W79-02172

MODEL AIDS PLANNERS IN PREDICTING RISING GROUND-WATER LEVELS IN SAN BERNADINO, CALIFORNIA,
Geological Survey, Laguna Niguel, CA.
W. F. Hardt, and C. B. Hutchinson.
Ground Water, Vol. 16, No. 6, p 424-431, November-December, 1978. 9 fig, 9 ref.

Descriptors: *Water levels, *Artificial recharge, *Mathematical models, *Groundwater, Natural recharge, Pumping, Monitoring, Water management(Applied), Artesian heads, *California, *San Bernadino(Calif).

Problems in the orderly development of the current water-management program in the San Bernadina Valley could result from imported water from Northern California recharging the ground water system. Intensive agricultural development in this area led to a decline in artesian water levels from 50 feet or more above land surface to 50-150 feet below land surface. If the artesian head were to again extend above land surface due to artificial recharge, buildings, public works and utilities could be damaged. A mathematical well-response model was developed by Durbin and Morgan to predict water-level changes that would occur in selected wells due to artificial recharge. In this study, a conceptual model of the flow mechanics and geologic framework of the basin was first developed. Then, using the data from the analysis of conceptual model, a mathematical model was devised to represent the prototype. The solution to the problem is based on the combined influence of natural recharge, artificial recharge, and groundwater pumping. The greatest unknown is the quantity and distribution of natural recharge. Artificial recharge and pumpage can be controlled. In addition to the predictive mathematical model, key monitoring wells are located between the recharge sites and the former swampy area to reflect the effects of the recharge program. (Purdin-NWWA)
W79-02173

THE NEED FOR PROFESSIONALISM AND ITS ATTRIBUTES IN HYDROGEOLOGY,
For primary bibliographic entry see Field 6E.
W79-02174

SURFACE WATER VS. GROUND WATER,
National Water Well Associaton, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 30, No. 12, p 26-27, December, 1978.

Descriptors: *Groundwate, *Surface water, *Water utilization, Economics, Water treatment, Aquifers, Reservoirs, Reliability

Although ground water accounts for 95 percent of the U.S. fresh water supply, only 25 percent of our total water needs are being met through the use of ground water. This is strange in view of the fact that ground water usually can be developed and produced cheaper and faster than surface water Operation and maintenance costs for ground water systems are up to 40 percent lower than surface water systems. Aquifers are better than surface reservoirs in that they are not subject to water loss or flooding. Also, they are protected from contamination by airborne particulate matter, organic matter and algae growth. New regulations under the Safe Drinking Water Act will probably raise surface water treatment costs but not ground water. Surface water supplies have been promoted by special interest groups for various monetary and political reasons. Ground water is a superior product and in this era of broader political and economic awareness it should be recognized as such and given precedence over surface water. (Purdin-NWWA)
W79-02176

IMPROVED TECHNIQUES FOR EVALUATING CARBONATE WATERFLOODS IN WEST TEXAS,
Exxon Co., Houston, TX.
C. J. George, and L. H. Stiles.
Journal of Petroleum Technology, Vol. 30, No. 11, p 1547-1553, November, 1978. 12 fig, 1 tab, 5 ref

Descriptors: *Water flooding, *Oil reservoirs, *Injection, Oil wells, Injection wells, *Texas, *Waterfloods.

Detailed studies of three waterfloods in Permian carbonate reservoirs of west Texas resulted in new depletion plans with major operating changes, including infill drilling and pattern modifications. An important aspect of these studies was the close coordination of geologic and engineering work that produced a consistent approach to the relationship between reservoir depletion and field procedures used to improve ultimate recovery. Problems in waterflooding Permian carbonates of west Texas occur basically because of the stratified nature of the pay, discontinuities, and ineffective well completions. Solutions and corrective measures to be used are derived from a good geologic description that determines the quantity and distribution of net pay, volumetric original oil in place, and floodable volume at the injector-to-producer spacing. Techniques were developed to improve the calculations of original oil in place and to better determine the relationship between floodable volume and injection pattern. This relationship was the basis for major program changes. In carbonate reservoirs volumetric original oil in place may be larger than the calculated value because of discontinuities and ineffective well completions. If so, the ratio of material balance to volumetric original oil in place can be considered a measure of reservoir continuity and effective well completions. (Purdin-NWWA)
W79-02182

INNOVATIVE WATER SYSTEM SOLVES QUALITY PROBLEM,
Tacoma Dept. of Public Utilities, WA. Water Div.
For primary bibliographic entry see Field 5G.
W79-02183

UNDERGROUND INJECTION CONTROL PROGRAM STUDIED,
For primary bibliographic entry see Field 5G.
W79-02184

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
S. D. Noel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 847, Price codes: A08 in paper copy, A01 in microfiche. Purdue Univ. Water Resources Research Center Technical Report 102. June 1978. 94 p, 17 fig, 12 tab, 41 ref, 2 append, 1 plate. OWRT C-6106 No. 5213(5).

Descriptors: *Groundwater, *Glacial aquifers, *Water wells, *Stratigraphy, Groundwater availability, Groundwater recharge, Specific yield, Radioactive dating, Geologic formations, Bedrock, Cass County(Ind), *Indiana.

The groundwater resources of Cass County, Indiana are currently underdeveloped. The glacial outwash aquifers probably are capable of supplying large amounts of good quality water for industrial, agricultural, and urban needs and may do so if the future of the resources is properly developed and managed. Aquifers are classified by their occurrence in Wisconsinan and Illinoian deposits and in bedrock. Wisconsinan aquifers in gravel are interbedded with glacial till and are of limited areal extent. Production is sufficient only for domestic needs, but large quantities are available locally These Illinoian valley train deposits are potentially the most productive aquifers in the county. Bedrock aquifers may have relatively large production, but the depth to the aquifers and variability in yields have resulted in their use only where adequate supplies are not obtainable from shallower sources. Throughout the county, groundwater quality is good except for high iron content and hardness values. The hardness increases with depth probably reflecting the underlying carbonate bedrock. (Wiersma-Purdue)
W79-02185

FOSSIL GROUND-WATER GRADIENTS IN ARID REGIONAL SEDIMENTARY BASINS,
Birmingham Univ. (England). Hydrogeology Section.
For primary bibliographic entry see Field 2F.
W79-02189

THE BLIND ZONE IN SEISMIC GROUND-WATER EXPLORATION,
James Madison Univ., Harrisonburg, VA. Dept. of Geology.
J. E. Sander.
Ground Water, Vol. 16, No. 6, p 394-397, November-December 1978. 3 fig, 6 ref.

Descriptors: *Seismic studies, *Groundwater, *Exploration, Geophysics, Locating, Transmissivity, Aquifer characteristics, Velocity, Aquicludes, Resistivity, *Seismic refraction, *Blind zones, *Saturated thickness.

Seismic refraction methods can often indicate the saturated thickness of an aquifer. However, if an impermeable blind zone layer is present, it will not show up in the refraction profile. As a result, saturated thickness and transmissivity values indicated by the profile will be too high. Thus, it is important in many cases to look for a blind zone layer, and resistivity data combined with geological considerations are two possible ways of inferring its presence. (Visocky-ISWS)
W79-02190

TRANSIENT SPHERICAL FLOW TO A NON-PENETRATING WELL WITH CONSTANT DRAWDOWN,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
C. S. Jaiswal, and H. S. Chauhan
Ground Water, Vol. 16, No. 6, p 432-436, November-December 1978. 3 fig, 1 tab, 11 ref.

Descriptors: *Wells, *Water wells, *Drawdown, *Pumping, *Model studies, Mathematical models,

Aquifers, Theoretical analysis, Equations, Hydraulic conductivity, Impervious soils, Confined water, Groundwater, Groundwater movement, Observation wells, Hydrology, *Nonpenetrating wells.

Flow to a flowing nonpenetrating well in a leaky artesian aquifer was analyzed. A method was suggested to determine the aquifer parameters using the pump-test data on such wells with constant drawdown in the well. A technique also was suggested to determine the aquifer parameters using the well itself as the observation well. (Sims-ISWS)
W79-02191

THE IMPACT OF THE USE OF HEAT PUMPS ON GROUNDWATER TEMPERATURES,
Northern Cheyenne Research Project, Lame Deer, MT.
C. B. Andrews.
Ground Water, Vol. 16, No. 6, p 437-443, November-December 1978. 6 fig, 2 tab, 16 ref. EPA R803971020.

Descriptors: *Heat pumps, *Wisconsin, *Groundwater, *Water temperature, *Model studies, Mathematical models, Heat transfer, Heat flow, Temperature, Groundwater movement, Aquifers, Energy, Energy transfer, Hydraulic conductivity, Dispersion, Seasonal, Heating, Cooling, Hydrology, Groundwater heat pumps.

The impact of the use of a heat pump for residential heating and cooling on groundwater temperatures was simulated by means of a mathematical model which couples the equations for groundwater flow with those for heat transport. A hypothetical case using data typical for southern Wisconsin was considered. Water was pumped from a recharged to a sandstone aquifer using a two-well system. Water was withdrawn from a deep well and injected into a shallow well during the heating cycle, and during the cooling cycle the system was operated in reverse. After 10 years of operation, water temperatures in the aquifer had changed less than one degree centigrade at a distance of greater than 40 meters from the wells. For the case considered, the use of heat pumps for residential heating and cooling would not adversely lower groundwater temperatures if use were restricted to sparsely populated areas. It was recommended that statutes which prohibit the injection of water directly into the subsurface be changed to allow the use of groundwater heat pumps. (Sims-ISWS)
W79-02192

ROLE OF GROUND WATERS IN THE FORMATION OF THE TOTAL RUNOFF OF A SMALL DRAINAGE BASIN IN THE FOREST ZONE,
E. A. Zal'tsberg.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 61-63, 1977. 1 fig, 1 tab, 7 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 109, No. 1, p 85-90, 1977.

Descriptors: *Base flow, *Runoff, *Small watersheds, *Groundwater, Watersheds(Basins), Forest watersheds, Hydrology, Discharge(Water), Foreign countries, Foreign research, Subsurface waters, On-site investigations, Hydrogeology, Hydrologic cycle, Analytical techniques, Analysis, *USSR.

To study the groundwater regime and budget, the northwestern hydrogeological party of the Northwestern Geological Survey and the Valday Hydrologic Scientific Research Laboratory have organized obsevations at three gaging stations and at a single cluster of wells near Krestovaya village in the central part of a small (432 sq km) drainage basin. Each line consists of 2-4 wells 5-8 m deep. The lines of the gaging stations are perpendicular to the direction of groundwater flow. The depth to groundwater is 0-1.5 m in loams and 1.5-3.5 m in sands and loamy sands, as a rule. Because of the general characteristics of atmospheric circulation in the northwestern region, the annual groundwater level regime in the Polomet' River basin is distinctly seasonal with two maxima (spring and autumn) and two minima (pre-spring and summer-autumn) and corresponding rises in spring and autumn and drops in winter and summer. The groundwater runoff of the investigated basin in the upper course of the Polomet' River plays an important role in the formation of total river runoff in winter and summer, when its proportion may reach 60-100%. Its role is relatively small during the spring and autumn flood periods. The quantitative characteristics obtained can be used to describe the role of groundwater in the total runoff of other small rivers of the forest zone, the basins of which are under similar climatic, geological, and hydrogeological conditions. (Humphreys-ISWS)
W79-02211

LONG-PERIOD GROUND-WATER REGIME IN THE EXCESSIVELY WET ZONE OF THE EUROPEAN USSR,
For primary bibliographic entry see Field 2F.
W79-02212

AN EVALUATION OF ISOTOPE CONCENTRATIONS IN THE GROUND WATER OF SAUDI ARABIA,
Geological Survey, Riyadh (Saudi Arabia). Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02254

GROUND WATER...CALIFORNIA'S PRICELESS RESOURCE,
California Dept. of Water Resources, Sacramento.
R. S. Ford.
California Geology, Vol 31, No 2, p 27-32, Feb 1978. 7 fig, 4 ref.

Descriptors: *Groundwater, *Overdraft, *California, Groundwater mining, Hydrologic cycle, Water table, *Specific yield, Water storage, Water quality, Springs, Drilling, Rotary drilling, Data collections.

Although forty percent of California is composed of valley areas underlain with groundwater, those reserves are presently being over-exploited, with water tables falling as much as 10 m per year in some areas. To explain the problem to the general public, this author provides here a brief explanation and discussion of the geologic framework within which the State's groundwater is stored, characteristics of movement, physical properties, and methods of extraction, including definitions useful for the layman of (1) the hydrologic cycle (zone of groundwater, perched groundwater, sustained yield, storage capacity, and hydraulic flow), (2) quality, (3) springs, (4) water well construction, and (5) groundwater data. (Tickes-Arizona)
W79-02392

LAND SUBSIDENCE DUE TO WATER WITHDRAWAL IN THE VICINITY OF PECOS, TEXAS,
Cornell Univ., Ithaca, NY. Dept. of Engineering; and Cornell Univ., Ithaca, NY. Dept. of Applied Physics.
M. J. Rosepiler, and R. Reilinger.
Engineering Geology, Vol. 11, No. 4, p 295-304, Dec. 1977. 4 fig, 1 tab, 10 ref.

Descriptors: *Land subsidence, *Subsidence, *Groundwater mining, *Water table, Geomorphology, Hydrogeology, Geological surveys, Geophysics, Sedimentology.

Land subsidence due to groundwater withdrawal is an important problem detected in several areas of the U.S. A group of researchers at Cornell University have been working with the National Geodetic Survey to determine vertical movements of the earth's crust as indicated by comparison of precise leveling surveys. This study documents a previously unreported case of subsidence in the vicinity of Pecos, Texas, where a close correlation between water level decline and land subsidence indicates that compaction of the dewatered sediments is responsible for subsidence. A system of benchmarks throughout and beyond the Pecos area was established and two sets of relative elevations for the benchmarks along two lines crossing the area were supplied by the National Geodetic Survey. An area approximately 50 km long and 30 km wide was observed to have subsided a maximum of over 200 mm. between 1935 and 1956 Water table decline during the same period was as much as 60 m, a 1:180 ratio to ground subsidence. (Tickes-Arizona)
W79-02396

DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 343, Price codes: A04 in paper copy, A01 in microfiche Colorado Water Resources Research Institute, Colorado State University, Completion Report No 87, August 1978. 37 p, 4 fig, 1 tab, 11 ref, append. OWRT A-033-COLO(1). 14-34-0001-8006.

Descriptors: *Groundwater, *Surface-groundwater relationships, Regulations, Optimization, Algorithms, Model studies, *Conjunctive use, Computer models, Water levels, River forecasting, Low flow, Groundwater management, Conjunctive operation.

In most available computer models of stream-aquifer interaction, the river stages are treated as boundary conditions. However in reality for low flow conditions, the problem is the prediction of the river stages. In addition for management purposes it is essential to have explicit relations between the decision variables such as pumping rates or upstream flow releases and the resulting states of the system such as downstream river flows and aquifer drawdowns. By combining the discrete kernel approach for an isolated aquifer with the discrete kernel approach for an isolated river (treated as a cascade of Muskingum reaches) it was possible to derive the discrete kernels (influence coefficients) for all the states of interest as responses to all the relevant decision variables. The developed tool is well suited for management due to the explicit nature of the relations which make it possible to formulate the management (optimization) problem as a Mathematical Programming problem for which efficient solution algorithms exist.
W79-02450

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF FOREST WORKINGS ON STREAMFLOW AND WATER QUALITY (PART I),
Forestry and Forest Products Research Inst., Tokyo (Japan). Div. of Forest Influences.
For primary bibliographic entry see Field 5C.
W79-02005

SEDIMENTATION IN HOT CREEK IN VICINITY OF HOT CREEK FISH HATCHERY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W79-02128

COMPARISON OF THE PREDICTIVE ACCURACY OF MODELS OF URBAN FLOW AND WATER-QUALITY PROCESSES,
Geological Survey, Bay St Louis, MS. Water Resources Div. and Geological Survey, Miami, FL Water Resources Div.
For primary bibliographic entry see Field 5B
W79-02253

ECOSYSTEM ANALYSES AT CORKSCREW SWAMP,
National Audubon Society, New York.
For primary bibliographic entry see Field 2I.
W79-02282

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 4D.
W79-02293

INTERIM RECOMMENDATION FOR THE USE OF BUFFER STRIPS FOR THE PROTECTION OF SMALL STREAMS IN THE MARITIMES,
New Brunswick Dept. of Fisheries and Environment, Fredericton. Maritime Forest Research Center.
For primary bibliographic entry see Field 5G.
W79-02384

RANGE CATTLE IMPACTS ON STREAM WATER QUALITY IN THE COLORADO FRONT RANGE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W79-02386

PRECIPITATION AND RUNOFF WATER QUALITY FROM AN URBAN PARKING LOT AND IMPLICATIONS FOR TREE GROWTH,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-02387

WETLAND ROAD CROSSING: DRAINAGE PROBLEMS AND TIMBER DAMAGE,
Forest Service (USDA), St. Paul MN. North Central Forest Experiment Station.
J. H. Stoeckeler.
Research Note NC-27, April, 1967. 4 p, 2 fig, 3 tab.

Descriptors: *Wetlands, *Minnesota, *Roads, *Damages, Culverts, Road construction, Lumber, Flood damage, Conduits, Conveyance structures, Surface drainage, Wetland road crossing, Timber damage.

More than half the 70 wetland road crossings observed in a northeastern Minnesota survey showed timber killed or weakened by a rise in the water table caused by the damming effect of the road. Occurrence of damage was affected by the direction of the road in relation to the contours of the land. All of the 39 crossing that showed damage were within 45 degrees of being parallel to the contour. Nearly two-thirds of the crossings over peatland showed damage compared with about one-fifth of those over mineral soil. The chief drainage problems were absence of culverts or other corss drainage, culverts set too high, no collector ditch, no discharge ditch, inadequate collector or discharge ditches, and low culvert capacity. (Steiner-Mass)
W79-02421

ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS: SOIL RELATIONSHIPS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
For primary bibliographic entry see Field 6G.
W79-02429

CONSEQUENCES OF SITE DISTURBANCES IN THE UPPER COASTAL PLAIN,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.
For primary bibliographic entry see Field 4D.
W79-02431

4D. Watershed Protection

TIRE MODULE SYSTEMS IN SHORE AND HARBOR PROTECTION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W79-02201

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
T. K. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 455, Price codes: A06 in paper copy, A01 in microfiche MS Thesis in Range Management, 1978. 91 p, 15 fig, 4 tab, 2 plates, 6 append. (California Water Resources Center Project UCAL-WRC-W-495). OWRT-B-175-CAL(4).

Descriptors: *Range management, *Erosion, Erosion control, *Environmental effects, *Land use, California, Sierra Nevada Foothills(Calif), Soil erosion, Sediments, Sedimentation.

The purpose of this investigation was to examine some range improvement practices commonly used in Sierra Nevada foothill beef cattle production. These range improvement practices can have both beneficial (food production, reduced fuel/fire danger, etc.) and adverse effects on the environment. Where adverse, measures are proposed to minimize this potential, e.g., leaving strips of trees to preserve relic habitat and to increase soil stability on a slope. Soil erosion was found to be the major category for prevention efforts, for it can be both a cause and effect of environmental degradation in rangeland. Causes of soil erosion vary from the land-clearing phase of vegetation-type conversion to overgrazing, and occasionally to access road construction. Soil erosion may result in sediment runoff to surface waters. This, in turn, may cause a detrimental impact on fishery and other beneficial uses of the waters if turbidity and dissolved oxygen depletion becomes harmful to the aquatic community. Other categories of impact include direct removal of wildlife habitat through vegetation-type conversion and indirect impacts on the cultural and biological resources. (Snyder-Calif, Davis)
W79-02293

SHOALING CONDITIONS IN SAWYER BEND AND LOWER ENTRANCE TO CHAIN OF ROCKS CANAL, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-02354

INTERIM RECOMMENDATION FOR THE USE OF BUFFER STRIPS FOR THE PROTECTION OF SMALL STREAMS IN THE MARITIMES,
New Brunswick Dept. of Fisheries and Environment, Fredericton. Maritime Forest Research Center.
For primary bibliographic entry see Field 5G.
W79-02384

WATER QUALITY OF STREAMFLOW FROM FORESTED WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5B.
W79-02404

CONSEQUENCES OF SITE DISTURBANCES IN THE UPPER COASTAL PLAIN,
Southern Forest Experiment Station, Oxford, MS Forest Hydrology Lab.
D. C. McClurkin, and D. M. Moehring.
Available from the Southern Forest Experiment Station. Proceedings: A Symposium on Principles of Maintaining Productivity on Prepared Sites, p 73-84. 1978. Mississippi State University, 3/21-22/78. Edited by Tom Tippin, Southern Forest Experiment Station. 48 ref.

Descriptors: Hydrologic properties, *Sediment control, *Microenvironment, *Soil erosion, *Soil physical properties, Harvesting, Forest management, Coastal plains, Federal Water Pollution Control Act, Water quality, Mississippi, *Forest practices, *Intensive site preparation, *Site productivity, Regeneration

In the past decade, traditional methods-of-cutting for natural regeneration of southern pine have been replaced by clearcutting, intensive site preparation, and planting. Although the practice is not new to the South, never before has it been so extensive or intense; nor has it caused so much public concern. If the exhortations of the South's Third Forest (Southern Forest Resource Analysis Committee 1969) are obeyed, 10 million acres of pine will have been reforested and 20 million acres of upland hardwood will have been converted to pine, mainly by clearcutting and planting, by the year 2000. The consequences of site disturbance due to forest activities are discussed in terms of alteration: in microclimate, water regime, hydrologic response, soil properties, soil movement, and sediment production. Also discussed are the relation to residual vegetation structure and implications for management. (Forest Service)
W79-02431

BROOK: A HYDROLOGIC SIMULATION MODEL FOR EASTERN FORESTS,
Forest Service (USDA), Durham, NH
C. A. Federer, and D. Lash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 311, Price codes: A05 in paper copy, A01 in microfiche. Water Resource Research Center, University of New Hampshire, Durham. Research Report No 19, 1978. 84 p, 17 fig, 6 tab, 64 ref. OWRT A-999-NH(5).

Descriptors: *Model studies, *Water budgets, *Watersheds(Basins), *Forests, *Water yield, Hydrology, Evapotranspiration, Transpiration, Streamflow, Temperature, Evaporation, Forest watersheds, *Forest management, *Simulation analysis, New Hampshire, Hubbard Brook(NH), North Carolina, Coweeta Watershed(NC), Harvesting, Nutrient concentration modeling, Soil evaporation, Nutrient studies, Simulation model, Eastern forests.

A hydrlogic model called BROOK simulates water budgets for forest land in the eastern United States. BROOK is a water-yield model for small areas; it was not designed to simulate flood peaks or watersheds with multiple aspects. It operates with a daily time interval, and requires daily precipitation and daily mean temperature as input variables. BROOK can simulate hardwood, conifer, mixed, cleared, and regrowing vegetation types, but these types must be uniform over the watershed. Partial cuts cannot be simulated. Evaportranspiration is divided into five components and streamflow into three components. The model was calibrated and verified using experimental watersheds at the Hubbard Brook Experimental Forest in New Hampshire and the Coweeta Hydrologic Laboratory in North Carolina. BROOK was designed to study the response of streamflow on different slopes and aspects to cover changes caused by harvesting and regrowth or by conversion from hardwoods to conifers. It has also been used to examine streamflow resonse to different hardwood transpiration characteristics, to estimate soil-water deficits prior to floods, to stimate soil water available for tree growth, as a base for nutrient concentration modeling, and as a teaching tool.
W79-02448

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A SURVEY OF PHOSPHORUS AND NITROGEN LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
J. H. Gakstatter, M. O. Allum, S. E. Dominguez, and M. R. Crouse.
Journal of the Water Pollution Control Federation, Vol. 50, No. 4, p 718-722, April 1978. 2 tab, 10 ref.

Descriptors: *National Eutrophication Survey, *Phosphorus, *Nitrogen, *Waste water treatment, *Municipal wastes, *Eutrophication, Sewage treatment, Sewage disposal, Effluents, Nutrients, Limiting factors, Phsophates, Regulation, Effluent limitations, United States, Activated sludge, Sewage lagoons, Waste water disposal.

During EPA's National Eutrophication Survey (begun in 1972), effluent samples from 809 municipal wastewater treatment plants in 47 states were analyzed for nitrite, nitrate, ammonia, dissolved orthophosphorus, total Kjeldahl nitrogen, total phosphorus, and total nitrogen. Median per-capita total phosphorus load from conventional waste treatment plants is 1.0 kg/yr, 74% immediately available for algal uptake, while mean total phosphorus export from agricultural land is about 30.8 kg/sq km/yr, of which only 43% is immediately available. Treated municipal wastewater from a city of 10,000 people could have the same impact as runoff from 560 sq km of agricultural land. Because they are controllable, point sources should be emphasized where excessive nutrients are a problem. Banning detergent phosphates can reduce municipal effluent phosphorus loads by about 50%, but there are few water bodies for which a detergent phosphate ban alone would provide adequate protection. Conventional treatment phosphate result in effluents with only 2-4 times as much nitrogen as phosphorus (optimum algal needs are 11-15:1), and receiving waters are often nitrogen limited; phosphorus is usually limiting in unimpacted waters. Typical median total phosphorus discharges from wastewater treatment plants are 6.1 mg/liter, and median total nitrogen discharges are 15 mg/liter (2.5 kg/capita/yr.). Median concentrations of both nutrients are significantly lower in activated sludge and stabilization pond effluents than in primary or trickling filter effluent. (Lynch-Wisconsin)
W79-02003

EFFECTS OF FOREST WORKINGS ON STREAMFLOW AND WATER QUALITY (PART I),
Forestry and Forest Products Research Inst., Tokyo (Japan). Div. of Forest Influences.
For primary bibliographic entry see Field 5C.
W79-02005

ATMOSPHERIC FORMATION, DISPERSION, AND DEPOSITION OF ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
C. Brosset.
Report B-444, June 1978. 14 p, 1 tab.

Descriptors: *Acids, *Atmosphere, *Air pollution effects, *Fallout, *Airborne transport, *Path of pollutants, Fossil fuels, Acidic water, Water pollution sources, Soil contamination, Dry fallout, Precipitation(Atmospheric), *Sweden, Sulfuric acid, Nitric acid, Sulfur, Nitrogen, Chemical reactions.

Important physical-chemical processes in the formation, transport, and deposition of atmospheric acid substances are described, primarily from data of Swedish stations. Quantification of deposition is not included. Acid substances are products which may form or contain acids, i.e., proton-donating chemical individuals. Most airborne sulfuric acid, HSO4 (-), and nitric acid is caused by fossil fuel combustion. In all combustion, nitrogen and oxygen in the air react in the high temperature zone, forming nitric oxide, and if the fuel is sulfurous, sulfur dioxide and trioxide are also formed. Sulfur trioxide is immediately converted under the influence of water and ammonia to slightly acid ammonium sulfate. Through photochemical reactions, nitric acid may be formed from nitric oxide and sulfuric acid from sulfur dioxide; catalytic processes may also be important in sulfuric acid formation. Acid substances formed may be introduced directly or indirectly to the recipient soil or lake as strong acids (sulfuric and nitric) or weak acids (HSO4(-) and ammonium); ammonium results from participation of ammonia in the atmospheric processes. Potential acidifying effect is associated with the concentration sum c sub H(+) + c sub HSO4(-). Most acidification is caused by (1) dry deposition of sulfur dioxide (and probably nitric acid), and (2) wet deposition of c sub H(+) and c sub HSO4(-). (Lynch-Wisconsin)
W79-02015

APPLICATION OF A MODEL OF ZOOPLANKTON COMPOSITION TO PROBLEMS OF FISH INTRODUCTIONS TO THE GREAT LAKES,
State Univ. of New York at Albany Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-02020

NEW METHOD FOR RECORDING HEART AND RESPIRATORY RATES IN CATFISH,
Georgia Inst. of Tech., Atlanta. School of Biology.
For primary bibliographic entry see Field 7B.
W79-02077

MEASUREMENT OF CHELATING AGENT LEVELS IN MEDIA WITH HIGH CONCENTRATIONS OF INTERFERING METAL IONS,
Missouri Univ.-Columbia. Dept. of Chemistry.
D. R. Jones, IV, and S. E. Manahan.
Analytical Letters, Vol. 8, No. 7, p 421-434, 1975. 1 fig, 4 tab, 7 ref. OWRT B-095-MO(3), 14-31-0001-4099.

Descriptors: *Chelation, *Chelating agents, Chelex, Analysis, Atomic absorption, EDTA, Copper, Metal ions, Measurement, *Pollutant identification, Cation exchange, *Water analysis.

A method is described for the measurement of strong heavy metal chelating agents in water based upon the solubilization of copper from a chelating cation exchanger followed by atomic absorption analysis of the solubilized copper. The copper concentration is thus equivalent to the concentration of chelating agent. A banded column is employed consisting of alternate layers of sodium-form Chelex and copper-form Chelex and copper form Chelex ion exchanger. The former serves to remove interfering ions which would displace copper whereas the copper-Chelex bands provide a sources of copper which is approximately 1 mg/l copper divalent chelating capacity, and equivalent ions can be tolerated in the sample up to approximately 1x10-2 M. Samples ranging in pH from 4 to 9 can be analyzed using this method.
W79-02079

ATOMIC ABSORPTION DETECTOR FOR CHROMIUM ORGANOMETALLIC COMPOUNDS SEPARATED BY HIGH SPEED LIQUID CHROMATOGRAPHY,
Missouri Univ.-Columbia. Dept. of Chemistry.
D. R. Jones, IV, and S. E. Manahan.
Analytical Letters, Vol 8, No 8, p 569-574, 1975, 5 ref. OWRT B-095-MO(4), 14-31-0001-4099.

Descriptors: *Organometallics, *Chromium compounds, *Atomic absorption, *Chromatography, *Pollutant identification, Organic compounds, Liquid chromatography, *Water analysis, Heavy metals.

Organometallic compounds are significant pollutants, therefore methods are needed for the analysis of specific compounds rather than total metal. This paper describes the use of high speed liquid chromatography (HSLC) interfaced with atomic absorption (AA) for the analysis of organometallics. The compounds are separated by HSLC and compounds of a specific metal measured by an AA instrument interfaced directly to the end of the HSLC column. Only compounds of the sought-for metal are observed, thus eliminating interferences and allowing for the use of relatively lower grade solvent for the mobile phase. Chromium acetylacetonate, tris (2' hydroxyacetophenono)chromium, and chromium hexafluoroacetylacetonate were separated using a mobile phase of 0.5% pyridine in toluene (v/v) and a Waters Associates Porasil A column. Three well defined peaks were obtained in less than 5 minutes at a flow rate of 2.5 ml/min. A detection limit of 40 nanograms in a 10 microliter sample was estimated. The basic approach should be applicable to the analysis of organometallic compounds in sediments and tissue.
W79-02080

LIMNOLOGY OF SELECTED LAKES IN OHIO - 1975,
Geological Survey, Columbus, OH., Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-02126

GEOLOGY AND GROUNDWATER RESOURCES OF NORTHERN BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02132

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02133

MAJOR AQUIFERS IN CLARK COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02134

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA., Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02141

VOLATILITY OF MERCURY FROM SOILS AMENDED WITH VARIOUS MERCURY COMPOUNDS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5B.
W79-02142

INVESTIGATION OF MATRIX INTERFERENCES FOR AAS TRACE METAL ANALYSES OF SEDIMENTS,
Gulf South Research Inst., New Orleans, LA.
M. M. McKown, C. R. Tschrin, and P. P. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 859, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-085, May 1978. 137 p, 62 fig, 46 tab, 21 ref. R 804317-01.

Descriptors: *Spectrophotometry, *Soil analysis, *Trace elements, *Sedimentology, Flame photometry, Soil chemical properties, Soil analysis, Absorption, Costs, Acid mine water, Fallout, Powerplants, Mine drainage, Analytical techniques, Atomic absorption, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Barium, Calcium, Strontium, Vanadium.

Research was conducted to develop reliable, cost-effective methods utilizing flame atomic absorption spectrophotometry (AAS) for the trace elemental analysis of soil and sediment samples containing complex matrices. Samples of bottom sediment affected by acid mine drainage, and soil samples exposed to fallout from a coal-fired power plant were studied. The soil sample matrix consisted of more than 0.1% aluminum and iron; the sediment sample matrix contained more than 0.1% aluminum and iron, plus small quantities of calcium, magnesium, manganese, phosphate, and potassium. Conventional flame AAS produced accurate results for the analyses of cobalt, copper, lead, manganese, nickel and zinc in these matrices. Accurate determination of barium, calcium, strontium, and vanadium could not be made by the conventional AAS techniques. However, reliable results for these metals were obtained utilizing appropriate flame types with the addition of lanthanum and/or an easily ionizable alkali salt to all samples and standards. It is concluded that the procedures used in this research should be applicable to all environmental samples containing similar matrices, and that the adaptation of the AAS techniques to samples other than those examined is possible. (Davison-IPA)
W79-02143

ANION EXCHANGE METHOD FOR THE DETERMINATION OF PLUTONIUM IN WATER: SINGLE-LABORATORY EVALUATION AND INTERLABORATORY COLLABORATIVE STUDY,
Monsanto Research Corp., Miamisburg, OH. Mound Facility.
C. T. Bishop, A. A. Glosby, R. Brown, and C. A. Phillips.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 435, Price codes: A05 in paper copy, A01 in microfiche. Report Nos. EPA-600/7-78-122 and MLM-2425, June 1978. EPA-IAG-D6-0015.

Descriptors: *Water analysis, *Laboratory tests, *Plutonium, *Pollutant identification, Analytical techniques, Testing procedures, Water sampling, Quality control, Anion exchange, Evaluation, Hydrologic properties.

Results of a single-laboratory evaluation and an intelaboratory collaborative study of a method for detemining plutonium in water are presented. The method, written for analysis of one liter samples, consists of a coprecipitation, acid dissolution, anion exchange, electrodeposition and alpha pulse height analysis. After single-laboratory evaluation of the selected method, duplicates of four different samples were sent to laboratories participating in the collaborative study. The first two samples were river water, the third a substitute ocean water sample, and the fourth, a river sediment with deionized, distilled water added. All samples contained known concentrations of plutonium-239 and plutonium-238 with concentrations ranging from 0.42 to 28.9 dis/min/liter. Combined within-laboratory standard deviation of the results averaged 5.7%. Average plutonium recovery was 69%. (Davison-IPA)
W79-02145

MACROINVERTEBRATE SAMPLING TECHNIQUES FOR STREAMS IN SEMI-ARID REGIONS: COMPARISON OF THE SURBER METHOD AND A UNIT-EFFORT TRAVELING KICK METHOD,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
C. E. Hornig, and J. E. Pollard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 643, Price code: A03 in paper copy, A01 in microfiche Final Report No. EPA-600/4-78-040, July 1978. 28 p, 2 fig, 6 tab, 19 ref.

Descriptors: *Aquatic life, *Bioindicators, *Sampling, *Testing procedures, Macroinvertebrates, Benthic fauna, Stream, Net samplers, White River, Utah, Water analysis, Benthos, Bottom sampling, Arid climates, Semiarid climates.

Intensive macroinvertebrate sampling from a fauna-poor riffle on the White River, Utah, was conducted using two standardized techniques: a unit-effort traveling kick method, and a square foot Surber stream-bottom sampling method. The Surber method was of limited utility in the streams of the arid and semiarid regions of the Western U.S., due to the combined effects of faunal paucity and patchiness. Comparisons of 50 kick samples with 40 Surber samples revealed that kick samples provided more highly reproducible data than Surber samples in terms of counts of individuals and taxa, percentages of composition, and diversity indices. The reliability of the Surber sampler data was improved when visually richer sites were preselected. Differences in organism selectivity noted were that the Surber method attributed greater relative importance to the more closely adherent and cryptic forms, such as the simuliids, and the kick method was relatively biased toward easily dislodged oranisms such as baetid mayflies. It is recommended that the unit-effort traveling kick method be intensively tested for routine biological monitoring in larger fauna-poor western streams. (Davison-IPA)
W79-02146

RESEARCH ON CONTROL TECHNOLOGY FOR ICE FOG FROM MOBILE SOURCES,
Environmental Protection Agency, College, AK. Alaska Water Lab.
For primary bibliographic entry see Field 5G.
W79-02147

MASS BALANCE DETERMINATIONS FOR POLLUTANTS IN URBAN REGIONS. METHODOLOGY WITH APPLICATIONS TO LEAD, ZINC, CADMIUM, AND ARSENIC.
California Inst. of Tech., Pasadena, CA. Dept. of Environmental Health Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 241, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-78-046, August 1978. 124 p, 17 fig, 17 tab, 129 ref. 68-03-4034.

Descriptors: *Pollutant identification, *Water pollution sources, *Path of pollutants, *Mass, Lead, Zinc, Cadmium, Chemical analysis, Analytical techniques, Distribution patterns, Movement, Industrial wastes, Arsenic compounds, Trace elements, Particle size, Systems analysis.

The methodology developed for constructing mass balances for pollutants, which are interlinked in their movement through the air, land and water of an urban industrial area is reviewed. Results are reported for lead, zinc, cadmium, and arsenic, and the data is published in the open literature. The analysis is based on the principle of the conservation of mass for a given chemical element. Flow diagrams for each chemical element balance are used, which trace the movement of the pollutants through the immediate environment, and into adjoining areas. New data on the physical mechanisms of trace metal deposition has been acquired, and the method of predicting the far deposition of lead, zinc, and cadmium is described. (Davison-IPA)
W79-02148

PROCEDURE FOR THE EVALUATION OF ENVIRONMENTAL MONITORING LABORATORIES,
Tracer Jitco, Inc., Rockville, MD.
C. Bicking, S. Olin, and P. King
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 718, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/4-78-017, March 1978. 224 p, 3 tab, 60 ref, 1 append. 68-03-2171.

Descriptors: *Laboratories, *Evaluation, *On-site investigations, Performance, Quality control, Laboratory equipment, Scientific personnel, Assessments, Inspection.

Procedures developed for use in evaluating laboratories engaged in measuring environmental pollution in the media of air, water, radiation and pesticides are presented. Laboratories are required to provide information on physical plant, equipment, personnel, quality control, and other aspects of laboratory performance on check list forms provided. On site inspection provides information on the less quantifiable laboratory aspects, and involves evaluation oriented to the specific methodology for which the laboratory is to be qualified. The scoring system is designed to be compatible with programs of proficiency testing, and is part of the total quality assurance program to objectively determine laboratory capability. This procedure is applicable to evaluation of laboratories of all sizes. (Davison-IPA)
W79-02149

EFFECT OF ANTIMYCIN ON STREAM INSECTS IN FIELD AND LABORATORY TRIALS,
Wisconsin Univ.-Madison. Dept. of Entomology
For primary bibliographic entry see Field 5C.
W79-02156

REDOX POTENTIAL MEASUREMENTS AS AN INDICATION OF BIOCHEMICAL WELL PLUGGING.
Ground Water Associates, Inc., Arlington, MA
W. B. Armstrong.
Ground Water, Vol. 16, No. 6, p 446-447, November-December, 1977. 2 fig, 1 ref

Descriptors: *Clogging, *Chemical precipitation, *Iron bacteria, Water wells, Well efficiency, Well rehabilitation, *Oxidation-reduction potential.

The Vyredox Method removes iron and manganese from ground water by injection of oxygenated water into the ground around a supply well. This stimulates the activity of certain beneficial bacteria which precipitate iron and manganese. The precipitates are held in the aquifer with a resulting improvement in water quality and improved long-term well efficiency. Hydrogeologic and geochemical investigations were made at an existing municipal supply well in the town of Pembroke, Massachusetts, to determine the feasibility of using the Vyredox Method. The existence of an active iron and manganese precipitating bacteria colony in the productive zone of the aquifer was confirmed as responsible for rapid plugging of the well. (Purdin-NWWA)
W79-02170

TRACE ELEMENT OF THE SARDIS RESERVOIR, MISSISSIPPI, AS RELATED TO CLAY MINERAL DISPERSION.

Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2H.
W79-02187

INSTRUMENTS FOR MONITORING THE QUALITY OF NATURAL AND WASTE WATERS,
A. S. Yakunin, A. A. Kuz'min, and V. B. Belyakov.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 73-76, 1977. 5 fig. Translated from Hydraulic Engineering and Reclamation (Gidrotekhnika i melioratsiya), No. 1, p 111-115, 1977.

Descriptors: *Water quality, *Monitoring, *Instrumentation, Measurement, Dissolved oxygen, Biochemical oxygen demand, Water temperature, Foreign research, Waste water(Pollution), Natural streams, Polarographic analysis, Analytical techniques, Methodology, Chemical analysis, *USSR.

Instruments were described for automatically measuring dissolved oxygen, BOD, and oxygen consumption by waste waters. Block diagrams of equipment components and electronic circuits were given. After automatic measurement of dissolved oxygen by the polarographic method, the tested water sample can be used for further analysis. The portable analyzers for measuring the content of dissolved oxygen and its consumption rate and the equipment for the automatic determination of the BOD meet operating requirements in the laboratory and field and are relatively simple, compact, and easy to operate. The analyzers and their equipment can be used in scientific and industrial laboratories for the analysis of any liquid media. (Humphreys-ISWS)
W79-02214

USE OF FLUORESCENCE MICROSCOPY FOR QUANTIFYING PHYTOPLANKTON, ESPECIALLY FILAMENTOUS BLUE-GREEN ALGAE,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W79-02239

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02242

AN EVALUATION OF ISOTOPE CONCENTRATIONS IN THE GROUND WATER OF SAUDI ARABIA,
Geological Survey, Riyadh (Saudi Arabia). Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02254

DEVICE FOR MEASURING PH AND TEMPERATURE OF A LIQUID, WHICH INCLUDES A MEMORY,
Dow Chemical Co., Midland, MI. (Assignee).
J. V. Goode, Jr.
U.S. Patent No. 4,109,527, 8 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2079, August 29, 1978.

Descriptors: *Patents, *Water pollution control, Monitoring, Instrumentation, Thermal pollution, Water temperature, Hydrogen ion concentration, Electronic equipment, Data processing, Data transmission.

Disclosed is a portable electronic probe device, including a memory system, which is useful for measuring the pH and temperature of waste streams from chemical processes, to avoid thermal pollution and undesirable algae growth in rivers or ponds into which the waste is discharged. The pH sensor consists of a glass electrode-reference electrode combination. The temperature sensor is made up of a thermistor fitted into a well enclosure at the bottom of the probe. A display box attached to the probe contains a memory system. The pH and temperature value is received by the memory system as an electrical signal. The signals are amplified, converted from analog to digital data, and stored in a digital memory. The pH and temperature data, and the precise location at which the measurement is taken, appear continuously as digital displays in a transparent panel on the display box. When the memory is full the probe device is placed in a charger stand to re-charge a battery in the memory system by a magnetic 'coupling' sequence. At the same time, the data in the memory is clocked into a computer-recorder associated with the charger stand, using an optical 'blocking' technique. In this device the memory system can record and store pH and temperature data from up to 192 locations before it becomes full. (Sinha-OEIS)
W79-02316

CHEMICAL CHARACTERIZATION OF LOCAL AND STRATOSPHERIC PLUTONIUM IN OHIO SOILS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
R. N. Muller.
Soil Science, Vol. 125, No. 3, p 131-136, March, 1978. 1 fig, 5 tab, 21 ref, 1 append.

Descriptors: *Isotope studies, Chemical analysis, Ecosystems, Industrial wastes, Soil contamination, *Ohio, *Plutonium, *Air pollution effects, Path of pollutants.

The chemical nature of plutonium derived from stratospheric fallout and industrial sources was studied in three agricultural soils. The majority of the soil plutonium was associated with a reductant-soluble, hydrous oxide phase that, under most conditions of terrestrial ecosystems, remains essentially immobile. The proportion of plutonium associated with organic matter (0.IN NaOH-extractable) varied among soils, and increased with decreasing particle size in the same soil. In a soil containing 238Pu from a local fabrication facility and 239,240Pu from stratospheric fallout, isotopic ratios between the NaOH-extractable and residual phases were essentially constant, indicating that, in these soils, plutonium from both sources behaves similarly. The distribution of soil plutonium with particle size appears to be most directly related to the mass of the soil particle. (Skogerboe-Colorado State)
W79-02320

SCANNING APPARATUS FOR SEPTIC EFFLUENTS,
Environmental Devices Corp., Marion, MA. (Assignee).
For primary bibliographic entry see Field 5D.
W79-02340

CONSIDERATIONS IN CONDUCTING BIOASSAYS,
WAPORA, Inc., Charleston, IL. Bioassay Lab.
D. R. Rosenberger.
U.S. Army Engineer Waterways Experiment Station, Technical Report D-78-23, June 1978. 144 p, 7 tab, 842 ref.

Descriptors: *Bioassay, Freshwater fish, *Toxicity, *Pollutant identification, Water pollution effects, *Literature reviews, *Bibliographies.

A discussion of the bioassay principles and techniques in the literature are presented to provide a background for an understanding of aquatic bioassay testing. Aquatic bioassays often encounter complex toxicity problems. Two or more toxic compounds may be acting together or the toxicant concentration may fluctuate. Techniques in aquatic testing may vary depending on the type of toxicant tested and environmental parameters, such as temperature or dissolved oxygen, that need be controlled. Toxicant dosing equipment varies with the type of test species, source of water, and type of toxicant in question. The two most widely used delivery systems are the serial diluter and proportional diluter. Selection of bioassay test species warrants careful consideration. The criteria for selection of species cited by most authors include: type of test; economic importance; ecological significance; geographical distribution; ease of capturing, handling, holding, and culturing; availability and local abundance; toxicity responsiveness; consistency of response to toxicity; and reproductive success under assay conditions. The vast majority of species discussed in the bioassay literature are freshwater fish, primarily bluegill, rainbow trout, fathead minnow, goldfish, and largemouth bass. Recommended methods for capturing, handling, and maintaining many plants and animals for use in bioassays are presented. (WES)
W79-02349

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES. PART V. SULFIDE DETERMINATION USING AG(+) ION SPECIFIC ELECTRODE AND VARIOUS MEASUREMENT METHODS,
Valmet Oy, Jyvaskyla (Finland).
J. Korhonen, and P. O. Lumme.
Paperi ja Puu, Vol. 60, No. 5, p 373-379, May, 1978. 6 fig, 14 ref, 5 tab.

Descriptors: *Water analysis, *Sulfides, *Pulp wastes, Electrodes, Silver, Ions, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Microorganisms, Hydrogen sulfide, Volumetric analysis, Waste water(Pollution), Spectrophotometry, Storage, Waste storage, Calibrations, White water(Paper machines).

Water and white water circuits of two paper machines known to contain microorganisms that produced hydrogen sulfide were samples, and the samples were stored in air-free bottles and analyzed at weekly intervals, using different calibration and titration methods in conjunction with a silver electrode. Those calibration methods involving samples and calibration solutions prepared with NaOH solution containing ascorbic acid gave the best results across the entire concentration range. Titrations produced satisfactory results at high concentration. The spectrophotometric standard method was fairly accurate at low concentrations, but its negative error increased with increasing sulfide concentration. Compared to the calibration method, spectrophotometry was very laborious and gave low values at high sulfide concentrations. Iodometry was suitable mainly for analysis of highly concentrated sulfide solutions. (See also W78-09523; W74-11094; and W74-11093) (Brown-IPC)
W79-02388

EVALUATION OF SEMIPERMEABLE MEMBRANES FOR CONCENTRATION OR ORGANIC CONTAMINANTS IN DRINKING WATER,
Gulf South Research Inst., New Orleans, LA.
I. Cabasso, C. S. Eyer, E. Klein, and J. K. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 245, Price codes: A09 in paper copy, A01 in microfiche. Final Report No EPA-670/1-75-001, June 1975. 192 p, 35 fig, 16 tab, 43 ref, 3 append. 68-03-0126.

Descriptors: *Pollutant identification, *Semipermeable membranes, *Water analysis, *Analytical techniques, *Osmotic pressure, *Reverse osmosis, *Osmosis, Separation techniques, Evaluation, Solutes, Water pollution, Water quality, Potable water, Trace elements, Membrane processes.

A study was conducted to develop an analytically sound concentration method based on membrane separation techniques, for concentrating and recovering trace organic chemicals in potable water. The five membrane materials evaluated through experiment and through a review of the literature included cellulose acetate, cellulose acetate butyrate, ethyl cellulose, polyamide, and polyurea (NS-1). Osmotic concentration (OC) and reverse osmosis (RO) were the two methods used to evaluate the membrane materials. A complete description of

the OC apparatus is provided; RO data are taken from the literature, and description of an RO concentration scheme is included. Results of the study, combined with data from the literature, show: the feasibility of concentration and recovery of organic solutes by osmotic techniques, and that: (1) the degree of recovery of organic solutes varies with the particular solute-membrane combination; (2) a membrane's salt rejection is a good indicator of its mechanical integrity, but not its potential for concentrating organics; (3) solute recovery is influenced by the applied osmotic or hydraulic pressure; (4) the cellulose acetate-derived membranes serve as satisfactory first-separation membranes; (5) polyurea and polyamide are best suited for final concentration; (6) rejection expected from OC runs were higher for short concentration runs than RO; (7) RO processes handled large volumes of water easier than the OC process; and (8) very high osmotic pressure could be applied in OC procedures without altering membrane properties. (Davison-IPA)
W79-02405

QUANTITATIVE MAPPING BY REMOTE SENSING OF AN OCEAN ACID-WASTE DUMP,
National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.
C. W. Ohlhorst.
Available from the National Technical Information Service, Springfield, VA 22161 as N78-33617 Price Codes : A03 in paper copy, A01 in microfiche. NASA Technical Paper 1275, October 1978. 26 p, 7 fig, 5 tab, 9 ref, 1 append.

Descriptors: *Waste identification, *Remote sensing, *Mapping, *Oceans, Analytical techniques, Acid wastes, Physical properties, Spectroscopy, Iron, Waste disposal, Industrial wastes, Organic wastes, Solid wastes, Sea water, Water pollution, Suspended solids, Waste dumps, On-site investigations, Inorganic compounds, Ocean dumping.

A remote sensing experiment was conducted at an ocean acid-waste dump site off the coast of Delaware to assess the possibility of relating remotely sensed spectral signatures to acid-waste concentrations. In situ water samples and measurements and concurrent remotely sensed data were obtained at the site. Results of the analysis for quantifying and mapping the acid-waste plume in terms of its particulate iron concentration and its suspended solids concentrations are presented. Total suspended solids, organic suspended solids, and inorganic suspended solids could not be accurately quantified and mapped with this data set. A linear least-squares-fit equation using the ratio of band 2 (440 to 490 nm) radiance to band 4 (540 to 580 nm) radiance was used to calculate iron concentration. The range of particulate iron concentrations in the plume ranged up to 1.1 mg/l at a depth of 0.46 m. A classification technique was developed to identify Sun-glitter affected pixels in the background-water data. (Davison-IPA)
W79-02407

COMPARISON OF METHODS FOR THE DETERMINATION OF TOTAL AVAILABLE RESIDUAL CHLORINE IN VARIOUS SAMPLE MATRICES,
Environmental Monitoring and Support Lab., Cincinnati, OH.
D. F. Bender.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 572, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/4-78-019, April 1978. 38 p, 1 fig, 15 tab, 15 ref.

Descriptors: *Pollutant identification, *Water analysis, *Chlorine, *Laboratory tests, Calcium compounds, Water treatment, Waste water, Effluents, Sewage, Potable water, Iodide reagents, River water, Distilled water, Chlorination, Oxidation, Testing procedures, Quality control, Water sampling.

Ten total available residual chlorine procedures were investigated to determine which procedure is most appropriate for particular sample matrices. All of the methods involve the same basic reaction: the oxidation of iodide reagents to iodine in a solution buffered at pH4. Data is provided concerning the precision, accuracy, and range, as well as the general advantages, and problems likely to be encountered in applying the methods to actual samples. Samples selected for study included distilled water, tap water, river water, a sewage plant effluent, and raw sewage; only the tap water did not require the addition of chlorine. Each of the methods worked well with certain matrices, but not in others, indicating the importance of the nature of the sample matrix. The data are tabulated, and a schematic representation shows the relative accuracy of the methods. (Davison-IPA)
W79-02412

PARTIAL CHARACTERIZATION OF CHLORINATED ORGANICS IN SUPERCHLORINATED SEPTAGES AND MIXED SLUDGES,
Municipal Environmental Research Lab., Cincinnati, OH
For primary bibliographic entry see Field 5D
W79-02413

INVESTIGATION OF THE MICROFLORA OF SWAMP ORE AND LAKE WATER BY THE METHOD OF ELECTRON MICROSCOPY, (IN GERMAN),
V. G. Dubinina, and Z. Derjugina.
Archiv Hydrogiologie, Vol. 71(1), p 90-102. November, 1977. 22 fig, 1 tab, 20 ref.

Descriptors: *Swamps, *Electron microscopy, *Iron bacteria, Wetlands, Bacteria, Microorganisms, Microscopy, Lakes, *Pollutant identification.

Electron and optical microscopy were used to investigate samples of swamp ore from two types of swamps and lacustrine freshwater. By means of electron microscopy a large number of small forms of iron bacteria and a number of interesting forms of microorganisms were revealed and some morphological details were clarified. In acidic swamps of pH 2.8-3.5, iron hydroxides have amorphous structure and the microflora was monotous. The microflora of samples of water and ores studied appeared to be more diversified and rich than had been previously assumed. (Steiner-mass)
W79-02423

A STATISTICAL EVALUATION OF SOME COLUMBIA RIVER BASALT CHEMICAL ANALYSIS,
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
F. Asare, H. V. Michel, and C. W. Myers.
Available from the National Technical Information Service, Springfield, VA 22161 as RHO-BWI-ST-3, Price codes: A02 in paper copy, A01 in microfiche. Report No RHO-BWI-ST-3, May 1978. 62 p, 13 fig, 7 tab, 7 ref. EY-77-C-06-1030.

Descriptors: *Chemical analysis, *Analytical techniques, *Atomic absorption, *Statistical methods, *Radioactive waste disposal, *Basalts, *Columbia River Basin, Correlation analysis, Geological units, Geologic formations, Stratigraphy, Geologic investigations, Soil chemistry, Neutron activation analysis.

A statistical evaluation of the chemical data of the basalt layers of the Columbia River Basalt Group to determine their usefulness for identifying and correlating basalt units is presented. Examination of the atomic absorption data indicates that the oxides were measured with precision better than 4%; neutron activation analysis was measured with a precision better than 6%. The most important elements for basalt characterization can be ranked in descending order: (1) chromium and iron; (2) scandium, europium, potassium, magnesium, and titanium; and (3) barium, calcium, cobalt, aluminum, and sodium. Samples from Core Holes DDH-1, DH-2, DDH-3, DH-4, and DH-5 were compared with the type locality reference groups to determine if correlations could be established statistically using the data. Overall, 90% of the basalt core samples in DDH-3, DH-4, and DH-5 down to the level of the Priest Rapids IV could be statistically correlated; the correlations were unambiguous for many. Below the Priest Rapids IV level, statistical correlations of the basalts were more ambiguous due to the greater chemical similarity of these basalts. (Davison-IPA)
W79-02433

ASBESTOS IN THE WATER SUPPLIES OF THE TEN REGIONAL CITIES, PART I,
McCrone Research Inst., Chicago, IL.
I. M. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 620, Price codes: A04 in paper copy, A01 in microfiche. Final Report No EPA-560/6-76-017, April 1976. 58 p, 1 fig, 14 tab, 12 append. 68-01-2690

Descriptors: *Pollutant identification, *Asbestos, *Water sampling, *Water pollution, Water analysis, Cities, Water supply, Surveys, Electron microscopy, Boston, New York City, Philadelphia, Atlanta, Chicago, Dallas, Kansas City, Denver, San Francisco, Seattle.

A nationwide survey was conducted to determine the impact of point and non-point sources on waterborne sources of asbestos. Both natural sites, in which asbestos bearing rocks are prevalent, and man-made sources were covered by the survey. As part of this program, an analysis was made of raw and finished water from the ten major cities housing regional headquarters of the Environmental Protection Agency: Boston, New York, Philadelphia, Atlanta, Chicago, Dallas, Kansas City, Denver, San Francisco, and Seattle. Results show essentially no asbestos fibers in New York, Chicago, Dallas, Kansas City and Denver. Asbestiform fibers were detected in Boston, Philadelphia, Atlanta and Seattle and the potential exists for asbestos contamination in the water supply of San Francisco. Asbestos content was determined by a transmission electron microscopic method. Samples of the water vacuum filtered through 47 mm diameter, 0.45 micrometer pore-size membrane filters that were then prepared for examination on the transmission electron microscope by a direct transfer method. (Gibson-IPA)
W79-02441

DETERMINATION OF METHYLMERCURY IN FISH OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
A. K. Koli, and W. T. Canty.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 537-543, 1978. 3 fig, 1 tab, 6 ref.

Descriptors: *Mercury, *Brown trout, Food chains, Heavy metals, Path of pollutants, Water pollution effects, Gas chromatography, Analytical techniques, Chemical analysis, Fish physiology, Animal metabolism, Methodology, *South Carolina, Pollutant identification, Tissue analysis, *Bioaccumulation, *Methylmercury, Monomethyl-mercury, Dimethyl mercury

Brown trout were analyzed for methylmercury using gas chromatography. Definite evidence that the fish contained monomethyl and dimethyl mercury was presented. Data on the specific laboratory techniques involved in extraction were included. The fate of mercury in the marine environment was also discussed. (EIS-Deal)
W79-02478

ETHYLMERCURY: FORMATION IN PLANT TISSUES AND RELATION TO METHYLMERCURY FORMATION,
Environmental Monitoring and Support Lab., Las Vegas, NV.
L. C. Fortmann, D. D. Gay, and K. O. Wirtz
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 093, Price codes: A02 in paper copy, A01 in microfiche Ecological Research Series. Report EPA 600/3-70-037, April 1978. 7 p, 2 tab, 2 fig, 8 ref

Descriptors: *Mercury, *Metals, *Plant physiology, *Plant biochemistry, Air pollution, *Air pollution effects, Laboratory tests, Bioassay, Laboratory tests, Ethylmercury, Methylmercury, Trace elements, Elemental mercury vapor.

Seedlings of the common dwarf garden pea, Pisum sativum, cv. Little Marvel, exposed to elemental mercury vapor formed both methylmercury and ethylmercury in all parts of the plant. Concentrations of both organomercury compounds fluctuated considerably over a 48-hour exposure period, but the total of detectable forms of mercury continued to rise due to increased ethylmercury formation. Ethylmercury formation was greater in the light than in the dark, but methylmercury concentration did not differ significantly. The pattern of change in the concentrations of methtylmercury suggests both are metabolites of a single mercury pathway in peas. (EIS-Katz)
W79-02488

THE EFFECTS OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
For primary bibliographic entry see Field 5G.
W79-02498

5B. Sources Of Pollution

SIGNIFICANCE OF NITRIFICATION IN STREAM ANALYSIS-EFFECTS ON THE OXYGEN BALANCE,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W79-02001

A DYNAMIC LAKE MODEL FOR TROPHIC STATE PREDICTION,
Eidgenoessische Anstalt fuer Waserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W79-02006

EXAMINATION OF A LAKE MODEL,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W79-02007

A SIMULATION MODEL FOR PHYTOPLANKTON GROWTH AND NUTRIENT CYCLING IN EUTROPHIC, SHALLOW LAKES,
For primary bibliographic entry see Field 5C.
W79-02008

ATMOSPHERIC FORMATION, DISPERSION, AND DEPOSITION OF ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W79-02015

KINETICS OF PHOSPHATE UPTAKE BY AQUATIC MICROORGANISMS: DEVIATIONS FROM A SIMPLE MICHAELIS-MENTEN EQUATION,
Wisconsin Univ.-Madison. Dept. of Soils.
For primary bibliographic entry see Field 5C.
W79-02016

A MATERIAL BALANCE STUDY OF POLYCHLORINATED BIPHENYLS IN LAKE MICHIGAN,
Dow Chemical Co., Midland, MI. Environmental Science Research Lab.
For primary bibliographic entry see Field 5C.
W79-02017

P-32 UPTAKE IN LENTIC ALGAE,
Georgia Inst. of Technology, Atlanta. School of Biology.
For primary bibliographic entry see Field 5C.
W79-02078

DISAPPEARANCE OF NITRATE UNDER TRANSIENT CONDITIONS IN COLUMNS OF SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W79-02122

ESTIMATES OF 7-DAY, 10-YEAR MINIMUM FLOWS AT SELECTED STREAM SITES IN PUERTO RICO,
Geological Survey, San Juan, PR. Water Resources Div.
E. D. Cobb.
Open-file report 78-583, August 1978. 47 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Streamflow, *Low flow, *Low-flow frequency, *Waste assimilative capacity, *Puerto Rico, Streams, Analytical techniques, Data collections, Regression analysis.

The 7-day, 10-year minimum flow of streams is used as an index for determining the capacity of streams to receive waste effluents. This index of flow was computed from streamflow records for 31 stream sites in Puerto Rico. In addition, there was a need for the 7-day, 10-year minimum flow at an additional 15 stream sites for which adequate streamflow data were not available. The flow index was estimated at these sites on the basis of available record, records at nearby sites, and comparisons with drainage areas. (Woodard-USGS)
W79-02125

WATER QUALITY IN THE OLD PLANTATION WATER CONTROL DISTRICT, BROWARD COUNTY, FLORIDA-PROGRESS REPORT, JULY 1976-JUNE 1977,
Geological Survey, Tallahassee, FL., Water Resources Div.
G. M. Russell, C. E. Hanson, and W. A. J. Pitt, Jr.
Open-file report 78-411, 1978. 29 p, 4 fig, 11 tab, 8 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Florida, *Canals, Coliforms, Nutrients, Trace elements, Insecticides, Bottom sediments, Water analysis, Sampling, Sewage effluents, Storm runoff, Agricultural runoff, Broward County(VA), *Plantation Canal(VA).

Water quality in the Old Plantation Water Control District in Broward County, Florida has been affected by effluent from sewage-treatment plants, agriculture, and storm-water runoff. Effect of effluent from sewage-treatment plants on water quality was evident at 3 sites where concentrations of nutrients and bacteria in the Broward County canals exceeded State standards of 2,400 colonies per 100 milliliters for total coliform bacteria. At 2 of the 3 sites the fecal coliform/fecal streptococcus ratios indicated possible human contamination. The effect of agriculture on water quality was evident where relatively high levels of chlorinated hydrocarbon insecticides had concentrated in the bottom sediments, of the canals. For example, DDD reached levels of 330 micrograms per kilogram at one site. The effects of storm-water runoff on water quality were detected during the wet season when concentrations of several trace elements increased. For example, zinc averaged 30 micrograms per milliliter in the wet season compared with 20 micrograms per milliliter during the dry season. (Woodard-USGS)
W79-02127

VOLATILITY OF MERCURY FROM SOILS AMENDED WITH VARIOUS MERCURY COMPOUNDS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
R. D. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 014, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. EPA-600/3-78-046, April 1978. 16 p, 4 fig, 2 tab, 8 ref.

Descriptors: *Mercury compounds, *Mercury volatilization, *Soil investigations, *Mercury, Soil physical properties, Soil texture, Mercury, Volatility, Sands, Clay loam, Loam.

Five different mercury compounds were used with three types of soil in a study conducted to determine the rate of mercury volatilization from soils freshly amended with mercury. Each of the soils, sand, loam, and clay was amended with each of the water-soluble mercury compounds: mercuric nitrate, mercuric chloride, mercuric acetate, mercuric oxide, and mercuric sulfide. It was concluded that mercury was volatilized from all the soils, but this loss was dependent on the soil type, and the form of mercury used. The maximum loss occurred within one week of the amendment. Further work is needed to determine the mechanism causing the volatilization of mercury applied to soil. (Davison-IPA)
W79-02142

SOURCE ASSESSMENT: WATER POLLUTANTS FROM COAL STORAGE AREAS,
Monsanto Research Corp., Dayton, OH.
R. A. Wachter, and T. R. Blackwood.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 420, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-004m, May 1978. 121 p, 10 fig, 55 tab, 69 ref, 4 append. 68-02-1874.

Descriptors: *Coal mine wastes, *Water pollution, *Effluents, *Drainage effects, Water quality, Soil chemical properties, Runoff, Storm runoff, Simulated rainfall, Leaching, Precipitation(Atmospheric), Waste water(Pollution), Water sampling, Hydrologic aspects, Organic matter, Inorganic compounds, Coal stockpiles.

Effluents, due to leaching and drainage during and after precipitation are emitted from coal stockpiles maintained outdoors at production and usage sites. Aquatic life forms are exposed to these effluents as the runoff flows into waterways. The effluent levels from these sources are quantified through examination of coals, newly mined and aged, from six coal regions of the U.S. A representative source is defined to help characterize the waste water level from coal storage areas. Coals from the various areas were subjected to a rainfall simulator, and grab samles of the waste water were taken to obtain effluent data. The samples were analyzed for organic and inorganic matter and water quality parameters. Hydrologic relationships were used to estimate the runoff concentrations. Water quality criteria concentrations are compared with these levels to estimate their potential environmental impact. Applicable and future control techniques are discussed along with the growth and nature of stockpile quantities retained at production and usage sites. (Davison-IPA)
W79-02144

MASS BALANCE DETERMINATIONS FOR POLLUTANTS IN URBAN REGIONS, METHODOLOGY WITH APPLICATIONS TO LEAD, ZINC, CADMIUM, AND ARSENIC.
California Inst. of Tech., Pasadena, CA. Dept. of Environmental Health Engineering.
For primary bibliographic entry see Field 5A.
W79-02148

STORM DERIVED LOSSES OF PHOSPHORUS AND THEIR SIGNIFICANCE TO ANNUAL PHOSPHORUS EXPORT FROM TWO NEW JERSEY WATERSHEDS,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
V. H. Smith.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 734, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, Oct 1976. 109 p, 28 fig, 8 tab, 34 ref. OWRT A-047-NJ(3), 14-34-0001-7064.

Descriptors: Streams, *Storm runoff, *Phosphates, Eutrophication, Reservoirs, Nutrients, *Phosphorus, *Nutrient removal, *New Jersey, Watersheds(Basins), Watershed management, *Path of pollutants, Dissolved solids, *Spruce Run Creeks(NJ), *Mulhockaway Creek(NJ), Water pollution sources, Self purification.

Transport of total phosphorus, total dissolved phosphorus, and soluble reactive phosphorus was measured under steady-state base flow and storm flow conditions in Spruce Run and Mulhockaway Creeks which drain adjoining watersheds and are the major water source for Spruce Run Reservoir, New Jersey. Day-to-day variability was greater in Spruce Run than Mulhockaway Creek as was the mean TP concentration. Apparently the SRP fraction was responsible for the difference. Estimated 240 day base flow loss of TP from Spruce Run Creek watershed was from .10 to .14 kg/ha and from Mulhockaway Creek it was .06 to .09 kg/ha. Approximate estimates of 365-day TP loading to the reservoir ranged from 0.17 to 0.24 g/m2/yr which exceeds the 'dangerous' level. Storm derived phosphorus export from both watersheds varied with storm intensity. Mild storms contributed only 1 to 2% over the base flow load whereas more intense storms could have contributed 50% or more of an annual TP load. Most of the storm derived TP was in particulate form which originated either from resuspended and scoured stream bed sediments or as soil particles in runoff.
W79-02151

THE EFFECTS OF STORM EVENTS ON THE ANNUAL PHOSPHORUS TRANSPORT IN SIX-MILE RUN,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
B. A. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 722, Price codes: A09 in paper copy, A01 in microfiche. Master of Science Thesis, May 1978. 177 p, 56 fig, 6 tab. OWRT A-047-NJ(4), 14-34-0001-7064.

Descriptors: Streams, *Storm runoff, *Phosphates, Eutrophication, Reservoirs, Nutrients, Nutrient removal, *New Jersey, *Path of pollutants, *Phosphorus, *Six-Mile Run(NJ), Dissolved solids, Water pollution effects.

The importance of storm events for calculating phosphorus loading was studied. Concentrations appeared to be unrelated to flow during low flows but showed a weak relationship during high flows, and there was no consistent diurnal fluctuation of the concentration. Weekly samples could depict the concentrations present in the stream for the previous week if no storm intervened. Large changes in concentration occurred during storm flows above 1,000 l/s. Dissolved fractions usually increased during peak flow but did not if the major rainfall was a distance upstream from the sampling site. Winter storms or melts behave similarly to rainstorms in regard to phosphorus concentration changes. Due to the high flows and increased concentrations during storms, the storms contributed close to 50% of the yearly phosphorus loading for this stream. Importantly, the total phosphorus loading could be predicted for a storm once the stream's characteristics were known. This would reduce the time-consuming process of collecting storm events. Therefore it is possible to calculate the steady-state and storm phosphorus loading for a stream once a few storms and steady-state are collected.
W79-02153

INTERTIDAL ENVIRONMENT OF NORTHERN DUBLIN BAY,
Trinity Coll., Dublin (Ireland). Dept. of Botany.
D. W. Jeffrey, P. H. Pitkin, and A. B. West.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 163-171, August 1978. 3 fig, 4 tab, 19 ref.

Descriptors: *Intertidal areas, *Pollutants, *Sediments, *Estuarine environment, Bays, Organic matter, Surveys, On-site investigations, Sampling, Cores, Metals, Phosphorus, Lead, Zinc, Copper, Chemical analysis, Analysis, Analytical techniques, Nitrogen, Sodium, Silts, Sands, Gravel, Correlation analysis, Foreign research, *Ireland.

A detailed survey of 10 km of the intertidal zone of Northern Dublin Bay was carried out by core sampling. One hundred samples were examined for variables, including particle size, organic matter, total nitrogen, phosphorus and lead, copper, and zinc. Results were presented in terms of: (1) correlations between pairs of variables; (2) location of sampling station; and (3) using multivariate analysis to achieve simple site classification. It was concluded that two distinct levels of environmental quality occur, with critical levels of organic matter, phosphorus, and zinc in the more polluted. A reasonable background level for organic matter for sandy mud would be 2.5% ignition loss or approximately 450 ppm total N. It was deduced from the low correlation coefficients that phosphorus may be either originating from a different source or is concentrated by a different process to organic matter. The decline in phosphorus concentration follows a more regular course, which is not markedly altered by changes in sedimentation. Background phosphorus concentration might sensibly be set at between 150 and 200 ppm P. The close correlation of the highest zinc and phosphorus values suggest either a common origin or a coprecipitation, or possibly both. Suggested background levels of zinc are in the order of 50 ppm. Although variation in copper was observed, strongly associated with both zinc and organic matter, concentrations as determined generally do not rise above a reasonable background of between 15-20 ppm. (Humphreys-ISWS)
W79-02204

COMPUTATION OF THE CONCENTRATION OF SUBSTANCES IN RIVERS AND CANALS,
Yu. A. Ibad-Zade, S. G. Gurbanov, and S. G. Azimov.

The concentration of polluting substances was computed for stationary waste water releases. It was assumed that it depends on x and y and that the turbulent diffusion coefficients differ in these directions and have constant values. A mathematical model presented for computing pollutant concentrations was verified from four series of experiments on the Kura River (USSR). During the field investigations, the following parameters were taken at five fixed gaging stations: (1) the velocity distribution on three verticals, (2) cross sectional areas, (3) slope of the water surface, (4) discharge, and (5) water samples for determination of the concentration of pollutants and background concentrations. Theoretical data generally agreed satisfactorily with the experimental data. (Humphreys-ISWS)
W79-02206

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02219

SURFACE DRIFTER MOVEMENTS OBSERVED IN PORT ANGELES HARBOR AND VICINITY, APRIL 1978,
Evans-Hamilton, Inc., Seattle, WA
For primary bibliographic entry see Field 2L.
W79-02221

SEASONAL FLUCTUATION OF WATER QUALITY (NUTRIENTS AND PIGMENTS) IN LOWER DELAWARE BAY,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W79-02223

SIMULATION MODEL OF CRYPTOMONAS OVATA POPULATION DYNAMICS IN SOUTHERN KOOTENAY LAKE, BRITISH COLUMBIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W79-02225

THE DISTRIBUTION AND FORM OF PHOSPHORUS IN NORTH ATLANTIC OCEAN DEEP-SEA AND CONTINENTAL SLOPE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL
J. W. Morse, and N. Cook.
Limnology and Oceanography, Vol. 23, No. 4, p 825-830, July 1978. 5 fig, 2 tab, 8 ref. NSF OCE 74-02352 A04.

Descriptors: *Sediments, *Phosphorus, *Deep water, *Continental slope, *Sediment-water interfaces, Apatite, Calcium carbonate, Diagenesis, Continental shelf, Oceans, Atlantic Ocean, Cape Hatteras(NC), North Carolina, Iron, Manganese, Carbon, Cycling nutrients, Distribution, Phosphates.

The general distribution of different forms of phosphorus in continental slope (Cape Hatteras, North Carolina) and deep-sea (central North Atlantic Ocean) sediments was investigated, as well as the extent to which this distribution is related to such other sediment compounds as organic carbon, calcium carbonate, and trace metals. Knoweldge of the chemistry of phosphorus diagenesis in these sediments is important in understanding the overall oceanic phosphorus cycle, since such sediments represent major oceanic phosphorus sinks. Core samples showed that apatite-phosphorus is the most important phosphatic component, and its abundance closely follows that of calcium carbonate in deep-se sediments. Nonapatite inorganic phosphorus correlates closely with acid-leachable iron and manganese. Organic phosphorus was most significant in reducing continental slope sediments, which also contained the highest amounts of organic carbon. Concentrations of dissolved reactive phosphate are similar to those found in shallow water sediments of the same general type. The cores (up to three m long) were taken from deep-sea sediments and seven from the continental slope. Deep-sea sediments with calcium carbonate as the dominate solid component had lower and less-variable dissolved reactive phosphate concentrations than deep-sea sediments with low calcium carbonate content. (Lynch-Wisconsin)
W79-02230

BEST MANAGEMENT PRACTICES TO CONTROL NONPOINT-SOURCE POLLUTION FROM AGRICULTURE,
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W79-02233

A COMPUTER SIMULATION OF PHOSPHATE AND NITROGEN TRANSPORT BY WATER RUNOFF,
Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
G. Kruh, F. Segall, A. Amberger, and J. Hagin.
Zeitschrift fur Pflanzenernahrung und Bodenkunde, Vol. 141, No. 4, p 385-395, 1978. 7 fig, 1 tab, 9 ref.

Descriptors: *Phosphates, *Nitrogen, *Computer models, *Soil erosion, *Water pollution sources, *Agricultural runoff, Rainfall, Rainfall intensity, Simulation analysis, Runoff, Nutrients, Model studies, Fertilizers, Subsurface flow, Drainage, Porosity, Soil physical properties, Hydraulic coefficient, Soils, Saturation, Surface runoff.

A computer model was designed to simulate soil erosion by rain and runoff. The mathematical representation was derived from Meyer and Wischmeier (models of soil detachment by water) and

from Ishihara (model of runoff and surface flow). The model computes the amount of soil and nutrients removed from agricultural field surfaces by erosion in two stages: (1) discharge rate of water on the surface and upper layer of the soil, and (2) contribution of soil detachment and transport by rainfall and runoff to losses of phosphorus, nitrogen, and soil. Computation of surface runoff and subsurface flow in a porous layer is essential for calculating erosion by runoff. Several computer runs with changing parameters illustrated the sensitivity of the model to changes in soil properties and characteristics and rain patterns. The rainfall for one October 1976 day in Haifa, Israel was 59 mm. In a model simulation, doubling that rainfall to 118 mm per day raised the underground water level from 12 to 20 cm, producing theoretical saturation of the supper soil layer. A uniform rainfall results in delay of runoff and a decrease in erosion. Erosion is doubled with an increase in slope steepness from 10 to 30 degrees, lateral water flow increases and underground level decreases. A porous upper soil layer 30 cm deep does not reach saturation in 24 hrs. Decreasing porosity from 43% to 20% produces rapid saturation. An increase in sublayer hydraulic coefficient induces faster drainage and thus prevents saturation of the upper layer and runoff. (Lynch-Wisconsin)
W79-02251

PARTICULATE AND DISSOLVED ORGANIC MATTER IN A SMALL PARTLY FORESTED ONTARIO STREAM,
Waterloo Univ., (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02252

COMPARISON OF THE PREDICTIVE ACCURACY OF MODELS OF URBAN FLOW AND WATER-QUALITY PROCESSES,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Miami, FL. Water Resources Div.
M. E. Jennings, and H. C. Mattraw.
In: Proceedings of National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, held at University of Kentucky, Lexington, Kentucky, July 26-29, 1976. 8 p, 5 fig, 3 tab, 11 ref.

Descriptors: *Peak discharge, *Urban runoff, *Model studies, *Mathematical models, Evaluation, Urbanization, Water quality, Urban hydrology, Storm drains, Surface runoff, Flood frequency, Forecasting.

Peak flow comparisons were made on four small urban catchments ranging in size from 47.8 to 613 acres using three selected stormwater runoff models. Average errors varied from -5 percent to 21 percent for the models. Preliminary studies of pollutant accumulation in one basin indicated pollutant loads can be related to rainfall volume and antecedent dry days with an average correlation coefficient of about 0.70. The surcharging effect of storm drains is indicated in comparisons of peak-flow frequency for one of the catchments studied. (Woodard-USGS)
W79-02253

HYDROLOGY AND WATER BUDGETS OF CYPRESS DOMES,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
K. Heimburg.
In: Third Annual Report on Cypress Wetlands, Floirda University, Center for Wetlands, Gainesville, p 56-67, 1976. 6 fig, 2 tab.

Descriptors: *Swamps, *Waste water, *Hydrologic properties, Wetlands, Water properties, Diffusion, Water table, Topography.

Surface water in a cypress dome is closely coupled to groundwater in the underlying water table aquifer. Usually the domes are a high on the water table, and water spreads radially outward from them recharging the water table. Infiltration from the swamps is governed by the position of the table relative to the surface water, as water tables fall during a dry period, hydraulic gradients around the swamps steepen and infiltration rates increase. Once surface water has moved into the water table aquifer, it moves out of the area under the influene of regional groundwater gradients, is used by the vegetation in areas surrounding the swamps or percolates to deeper aquifers. Surface flow into specific domes is primarily dependent on topography, but no clear relationship between runoff and surface characteristics has been established. When considered for waste water loading, sites should be selected for high infiltration rates. High water tables anywhere near a swamp reduce infiltration; these are associated with hills and slopes, which also increase runoff into the swamps, so flat sites are desirable. Smaller swamps are preferable for the most infiltration from the minimum area of swamp, there is more perimeter per unit surface area for infiltration. (See also W79-02256) (Steiner-Mass)
W79-02257

DISSOLVED HYDROGEN SULFIDE IN SOIL WATER IN SAN FELASCO HAMMOCK AND DEERHAVEN CYPRESS DOME,
Florida Univ., Gainesville. Center for Wetlands.
L. A. Burns.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 780-802, 1976. 2 fig, 3 tab, 14 ref.

Descriptors: *Swamps, *Hydrogen sulfide, Wetlands, Florida, Sulfides, Sulfur compounds, Muck soil.

A sampling reconnaissance of a cypress dome receiving high sulfate waste water from the Deerhaven steam-electric generating plant, and of floodplain soils of Turkey Creek in Sanchez Prairie, was conducted to determine concentrations of hydrogen sulfide dissolved in the soil solution. Background determinations were made for both sulfate and sulfide concentrations at Blue Spring on the Sante Fe River, and in the watershed of Possum Branch, a tributary of Hogtown Creek. Concentrations of hydrogen sulfide of 8 to 12 ppm were found in the soil solution in the Deerhaven dome. Concentrations ranging from 0.09 ppm at the edge of the floodplain to 4.4 ppm in a 'dead-tree' area were found in the Sanchez Prairie area of San Felasco Hammock. In the Possum Branch floodplain, concentrations ranged from 0.09 ppm at the edge of the floodplain to 0.25 ppm near the center of the floodplain. Sulfide concentrations in the vegetated margin of the Blue Spring boil pool and run, and in the Sante Fe River floodplain, ranged from 0.30 to 0.50 ppm. A soft organic deposit along the run had 1.40-2.26 ppm sulfide. (See also W79-02256) (Steiner-Mass)
W79-02285

PRELIMINARY EVALUATION OF FINAL CUT LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5G.
W79-02292

REDUCTION OF NITRATE IN A SOIL COLUMN DURING CONTINUOUS FLOW,
California Univ., Berkeley. Dept. of Biology.
For primary bibliographic entry see Field 2G.
W79-02366

SULFATE TURPENTINE IN UNPURIFIED AND PURIFIED EFFLUENTS FROM THE BAIKAL PULP MILL (SUL'FATNYI SKIPIDAR V NEOCHISHCHENNYKH I OCHISHCHENNYKH STOKAKH BAIKAL'SKOGO TSELLYULOZNOGO ZAVODA),
Gidrokhimicheskii Inst. Novocherkassk (USSR).
T. P. Churilova, L. I. Nomikos, T. N. Pisareva, and G. A. Budakov.
Materialy Vsesoyuznogo Simpoziuma po Sovremennym Problemam Samoochishcheniya i Regulirovaniya Kachestva Vody, 5th, Vol. 3, p 123-125, 1975. 2 ref.

Descriptors: *Pulp wastes, *Turpentine, *Kraft mills, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Waste water treatment, Gas chromatography, Water analysis, Organic compounds, Terpenes, Soviet Union(USSR), Kraft mills, Lake Baikal(USSR).

Terpene compounds discharged with purified effluents from the Baikal kraft mill (USSR) are oxidized in Lake Baikal more slowly than are terpenes under laboratory conditions simulating those of the lake. This indicates that turpentine components undergo modification during the effluent purification process (involving biochemical and chemical treatments, mechanical purification, and aeration). To study the nature of the modification, gas-liquid chromatographic analyses were conducted of turpentine formed during the kraft cooking process, of turpentine in the effluents at various stages of purification, and of terpene compounds in Lake Baikal. Terpene hydrocarbons predominated in the crude turpentine and in the unpurified effluent. A large amount of volatile terpenes (up to 94%) was found in purified effluent, while the amount of terpene hydrocarbons was low (about 6%). These volatile compounds were also found in the lake. A certain amount of oxygen-containing compounds was found in the purified effluent. (Stapinski-IPC)
W79-02378

CONVERSION OF LIGNOSULFONATES IN NATURAL WATERS (PREVRASHCHENIE LIGNOSUL'FONATOV V PRIRODNYKH VODAKH),
Gidrokhemicheskii Inst., Novocherkassk (USSR).
G. I. Ganin, V. T. Kaplin, and V. A. Kriul'kov.
MAterialy Vsesoyuznogo Simpoziuma po Sovremennym Problemam Samoochishcheniya i Regulirovaniya Kachestva Vody, 5th, Vol. 3, p 13-17, 1975. 7 ref.

Descriptors: *Biodegradation, Lignins, *Sulfonates, *Pulp wastes, Natural streams, Laboratory tests, Microorganisms, Dissolved oxygen, Hydrogen ion concentration, Water pollution, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Pollutants, Nitrogen compounds, Phenols, Organic acids, Alcohols, Lignosulfonates.

Laboratory studies of the biochemical degradation of lignosulfonates (LS) isolated from spent sulfite liquor have shown that the process is slow; the LS concentration in natural water was reduced 30% in two weeks, and only 4-5% during the subsequent 25 days. Evidently, the degradation initially involves the low-molecular weight fraction, with the remaining high-molecular weight fractions quit resistant to microorganism attack. The degradation process decreased the dissolved oxygen content and pH of the water, and had a significant effect on the mineral nitrogen content in water; there was an initial increase in the ammonium and nitrite nitrogen contents followed by a reduction of the concentration of these compounds. Phenols, organic acids, and alcohols were formed during LS degradation. Analyses of river water near the discharge site of a pulp and paper mill showed that biochemical degradation of LS does take place, with the intensity of degradation higher in the bottom deposits (where LS accumulates) than in the body of water. (Stapinski-IPC)
W79-02379

PRECIPITATION AND RUNOFF WATER QUALITY FROM AN URBAN PARKING LOT AND IMPLICATIONS FOR TREE GROWTH,
Missouri Univ.-Columbia.
C. H. Pham, H. G. Halverson, and G. M. Heisler.
Department of Agriculture, Forest Service, Research Note NE-253, 6 p, 1978. 15 ref, 4 tab.

Descriptors: *Water quality, *Storm runoff, *Trees, *Precipitation(Atmospheric), *Paving, New Jersey, Runoff, Surface runoff, Water supply, Phosphorus compounds, Lead, Copper compounds, Drainage, Parking lots, Urban runoff.

The water quality of precipitation and runoff from a large parking lot in New Brunswick, New Jersey was studied during the early growing season, from March to June 1976. Precipitation and runoff from 10 storms were analyzed. The runoff was higher in all constituents considered except for P, Pb, and Cu. Compared with published values for natural waters, sewage effluent, and storm-water drainage from urban land, the parking lot runoff was not highly polluted. It appears that such runoff is a satisfactory source of water for urban trees. (Witt-IPC)
W79-02387

WATER-QUALITY MONITORING IN THE AMERICAN URBANIZING SOUTHWEST,
Metcalf and Eddy, Boston, MA.
B. P. Popkin.
Paper presented at International Symposium on Urban Stormwater Management, University of Kentucky, Lexington, July 24-27, 1978, 6 p. 4 tab, 36 ref.

Descriptors: *Water quality, *Monitoring, *Urban hydrology, *Southwest U.S., Baseline studies, Precipitation(Atmospheric), Water pollution, Land use, Soil water, Overland flow, Groundwater movement, Water sampling.

The principles of water quality monitoring required in the fast-growing American Southwest are predicated on the extensive hydrologic and environmental effects of urbanization. As reviewed here, hydrologic events are sporadic in this region, highly variable and ephemeral over changing watersheds, thus requiring that techniques be modified accordingly. Guidelines for monitoring atmospheric precipitation, overland flow, streamflow, point pollutant discharges, soil water, and groundwater are suggested in terms of station selection, sample stabilization, and monitoring problems and solutions. Objectives of monitoring and data evaluation are discussed. The unique problems of water quality monitoring in the arid southwest are solvable, although most solutions depend on creative and flexible planning, training, and communication. (Tickes-Arizona)
W79-02397

WATER QUALITY OF STREAMFLOW FROM FORESTED WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. W. Gregory, and P. F. Ffolliott.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 6, Proceedings, 1976 Meetings of the Arizona Section American Water Res. Assn. and the Hydrology Section, Arizona Academy of Science, April 29-May 1, 1976, Tucson, Arizona. OWRT A-066-ARIZ(1), 14-34-0001-6003.

Descriptors: *Water quality, *Sedimentary soils, *Ponderosa pine forests, *Streamflow, *Arizona, *Forest watersheds, *Heber Watershed(Ariz).

To provide quantitative baseline information on water quality of streamflow from ponderosa pine watersheds on sedimentary soils, water samples were collected at the mouths of four watersheds at time of surface runoff and during extreme or unusual hydrological events. In each sample, calcium (Ca++), magnesium (Mg++) and sodium (Na+) were determined by using atomic absorption spectrophotometry; carbonate (CO=3) and bicarbonate (HCO-3) were measured by titrating with standard acid; fluoride (F-), sulfate (SO=4), 3 nitrate (NO-3), and chloride (Cl-) were determined by colorimetric methods using an Autoanalyzer; hydrogen ion concentration (pH) was measured by using a glass electrode; and suspended sediment concentrations were determined by filtration. The data obtained were compared with EPA water quality standards for aquatic life, irrigation, and public water supply. Although the EPA levels of acceptability have not been established for many of the chemical and physical water constituents, the parameters determined in this study, in general, fall within the EPA prescribed limits. (Hasbrouck-Ariz)
W79-02404

NITRATE REDUCTION BY DENITRIFYING BACTERIA IN SINGLE AND TWO STAGE CONTINUOUS FLOW REACTORS,
Queen's Univ., Kingston (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-02406

MODEL FOR DECOMPOSITION OF ORGANIC MATERIAL BY MICROORGANISMS,
Utah State Univ., Logan. Ecology Center.
For primary bibliographic entry see Field 2G.
W79-02415

FIELD PERSISTENCE AND MOVEMENT OF TRIFLURALIN IN TWO SOIL TYPES,
Tennessee State Univ., Nashville.
For primary bibliographic entry see Field 2G
W79-02417

CONSEQUENCES OF SITE DISTURBANCES IN THE UPPER COASTAL PLAIN,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab
For primary bibliographic entry see Field 4D.
W79-02431

PROCEEDINGS OF A WORKSHOP ON THE EVALUATION OF MODELS USED FOR THE ENVIRONMENTAL ASSESSMENT OF RADIONUCLIDE RELEASES.
Oak Ridge National Lab., TN.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-770901, Price codes: A07 in paper copy, A01 in microfiche. Report No CONF-770901, April 1978. Workshop held in Gatlinburg, Tennessee, September 6-9, 1977. 131 p, 4 tab, 183 ref, 1 append.

Descriptors: *Mathematical models, *Radionuclides, *Path of pollutants, *Dosimetry, *Radioactivity effects, *Public health, Radioactive fallout, Food chains, Atmospheric pollution, Evaluation, Future planning, Gamma rays, Safety, Waste treatment, Nuclear wastes, Radioactive waste disposal, Water cycle, Lethal limit, Soil contamination, Conferences.

The workshop was held to evaluate the predictive capabilities of the various mathematical models used in radiological assessments. The five major tasks of the workshop were: (1) a critical review of current practices in the environmental assessment of routine accidental releases of radionuclides; (2) the determination of limitations associated with these methods; (3) the identification of critical parameters which may contribute to error in model results; (4) the recommendation of improvements and future research for parameter determination, model development and model validation; and (5) the recommendations of models and parameter values most suitable for future assessments of radioactive releases to the environment. The topics covered by the working sessions were: atmospheric transport; aquatic and food chain transport; terrestrial food chain transport; and internal and external dosimetry. Abstracts for three of the reports are included. (Davison-IPA)
W79-02434

VIRUS TRANSPORT THROUGH SOLID BEDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
S. Sundaram.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 310, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1977, 92 p. 26 fig, 22 tab, 19 ref, 4 append. (California Water Resources Center Project UCAL-WRC-W-523). OWRT B-184-CAL(2).

Descriptors: *Viruses, *Percolating water, *Percolation, *Water pollution sources, *Soil contamination, *Path of pollutants, Virus transport, Model studies, Forecasting, Solid wastes, Waste water disposal, Waste disposal.

A theoretical model for predicting the breakthrough curve of viruses from solid beds is developed. This model includes the percolation of contaminated water through clean solid beds (saturation) and of uncontaminated water through contaminated beds (elution). This model involves the solution of the reaction kinetic form of the adsorption/ion exchange equations when the effects of external mass transfer are important. The principal variables are column volume, volumetric flow rate, fluid volume passing through the column, stoichiometric capacity of the column and particle size. The model has been used to predict the breakthrough curve of the virus T4 bacteriophage on activated carbon where the Langmuir adsorption of T4 bacteriophage on activated carbon was evaluated using literature data. The model predictions agree favorably with qualitative experimental observations reported in the literature for virus breakthrough from activated carbon columns where the variables studied included bed length, flow rate and particle size. Breakthrough curves were also predicted for the transport of f-2 bacteriophage through soil columns using rough estimates of adsorption isotherms from literature data. Although these breakthrough curves were much different from the activated carbon system, the model was also in qualitative agreement with reported experimental observations for these soil systems in both saturation and elution operations. (Snyder-Calif, Davis)
W79-02447

POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
E. R. Bennett, and K. Linstedt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 309, Price codes: A11 in paper copy, A01 in microfiche Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Completion Report No 84, September 1978. 207 p, 36 fig, 68 tab, 88 ref. OWRT A-028-COLO(4).

Descriptors: *Storm runoff, Water pollution sources, Colorado, *Waste characteristics, *Snowmelt runoff, Sampling, *Mass loadings(Wastes), Water pollution treatment, Waste water treatment, *Boulder(Colo).

The pollutional characteristics of stormwater runoff were evaluated by sampling stormsewer discharges at three locations. The study was made in Boulder, Colorado and the emphasis was placed on the characteristics of snowmelt runoff. The runoff from three types of land use areas were studied. The sampling locations included a stormsewer outfall for an urbanized residential area with a population density of 25 persons per acre (62 persons per hectare); the outfall of the storm-sewer serving a suburban area with a density of 12 persons per acre (30 persons per hectare) and the runoff from an uninhabited, unsewered mountain watershed. The results showed that pollution from snowmelt is released more slowly than from rain runoff to a receiving stream and therefore the maximum concentrations were lower than those for rainfall. The total mass loadings were slightly lower for snowmelt compared to rain runoff on the same area for the major pollutants, COD, total and suspended solids. The mass loadings were much lower in snowmelt for the nutrients, nitrogen and phosphorus. Preliminary treatment evaluations of stormwater runoff were made using the process of plain sedimentation, coagulation-sedimentation using lime, alum, and ferric chlorides and by sand filtration. Due to the colloidal nature of the organic matter in the stormwater, coagulation-sedimentation and filtration were effective treatment methods but plain sedimentation gave relatively poor results.
W79-02451

ORGANOCHLORINE AND MERCURY RESIDUES IN FISH FROM LAKE SIMCOE, ONTARIO 1970-76,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
R. Frank, M. Van Hove Holdrinet, R. L. Desjardine, and D. P. Dodge.
Environmental Biology of Fishes, Vol. 3, No. 3, p 275-285, 1978. 4 tab, 1 fig, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Mercury, *Pesticide residues, *Path of pollutants, *Chlorinated hydrocarbon pesticides, *Freshwater fish, Canada, DDT, DDE, Heptachlor, Insecticides, Fish eggs, Fish reproduction, Lipids, Perches, Food chains, Food webs, Trophic levels, Fish reproduction, Agricultural runoff, Salvelinus, *Lake Simcoe(Ontario), Perca, *HEOD.

Ten species of fish were collected between 1970 and 1976 from Lake Simcoe for organochlorine and mercury analysis. DDT residues significantly declined between 1970 and 1975-76 in all species except small Stizostedion vitreum vitreum and large Salvelinus namaycush. Eggs taken 1975-76 from small S. namaycush had DDT residues below the critical level reported for the production of viable offspring, but this was not so for large members. III OD residues between 1970 and 1975-76 significantly declined in five species and PCB residues declined in all species except the larger Perca flavescens. Chlordane and heptachlor-epoxide were identified in S. namaycush for the first time in 1975-76. Mercury residues showed no change between 1970 and 1975-76 in five species, it declined in two species and increased in small S. v. vitreum. Correlations existed between levels of organic contaminant and lipid content of fish especially in the immediate post period of their use. Where the increasing lipid content was associated with an increasing trophic level a prey-predator relationship existed for contaminant accumulations. However, where lipid contents were low, no correlation appeared to exist in the prey-predator. (EIS-Katz)
W79-02456

FURTHER DATA ON HEAVY METALS AND ORGANOCHLORINES IN MARINE MAMMALS FROM GERMAN COASTAL WATERS,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
U. Harms, H. E. Drescher, and E. Huschenbeth.
Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 3-4, p 153-161, 1978. 2 tab, 3 fig, 26 ref.

Descriptors: *Heavy metals, Mammals, Aquatic animals, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Organochlorines, Metals, Path of pollutants, DDT, Polychlorinated biphenyls, Food webs, Copper, Zinc, Cadmium, Lead, Mercury, Food chains, *Harbor seals, Phoca, *Baltic Sea, *Marine mammals.

Studies on heavy metals and organochlorines in harbour seals (Phoca vitulina) were continued and extended to other marine mammals, which were found off the German North Sea and Baltic coasts. The results are compared with contamination levels in fish which form the major food source of the marine mammals investigated. Concentrations of copper, zinc, cadmium and lead in muscle and liver tissues of fish did not differ significantly from corresponding organs of the marine mammals. However, considerably higher amounts of mercury were found in the liver of seals and whales than in fish. Higher mercury concentrations in seals are closely related to the age of the animals. The highest amount of 160 mg/kg (ppm) Hg was found in an adult seal. In contrast to fish a high percentage of total mercury occurs in the inorganic form in seal and whale liver. The degree of contamination with organochlorines (PSB and total DDT) in seals and whales studied so far is of the same order of magnitude. Maximum values in seal blubber amount to 27 mg/kg (ppm) for DDT and 564 mg/kg (ppm) for PCB (wet weight). A comparison of fish and marine mammals shows that the pesticide burden in the various tissues is in the first instance a reflection of their lipid content. Seals form an exception, as the DDT and PCB content is comparably lower in the brain than in the liver which contains less fat. This is probably due to a brain barrier against an accumulation of organochlorines. (EIS-Katz)
W79-02460

UPTAKE, RETENTION AND LOSS OF CADMIUM BY BROWN SHRIMP, (CRANGON CRANGON),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
V. Dethlefsen.
Berichte dew Deutschen Wissenschaftlicher Kommission fur Meeresforchung, Vol 26, No 3-4, p 137-152, 1978. 11 fig, 8 tab, 32 ref.

Descriptors: *Shrimp, *Cadmium, *Absorption, *Path of pollutants, *Commercial shellfish, Crustaceans, Invertebrates, Laboratory tests, Metals, Animal physiology, Estuarine environment, Water pollution effects, Environmental effects, Crangon, *Bioaccumulation, *Depuration, *Brown shrimp.

Crangon crangon were exposed to Cd-concentrations of 5-100 microgr/l in static tests and 1,5-2,5 microgr/l in constant flow through tests. Loss and retention experiments were conducted after an uptake period of 20 days. A rapid shorttime accumulation characterized by the building of an early plateau was followed by a long term accumulation characterized by a linear increase of the total body load. For no concentration of Cd a final equilibrium between body load and water concentration was encountered, but in the 1,5 microgr Cd/l flow through experiment no uptake of Cd by C. crangon could be measured. Major sites of accumulation were gills and hepatopancreas, no significant uptake was found to take place in the abdominal muscle. Cd was incorporated into the exoskeleton. Retention of Cd was very effective after exposure to 5 microgr Cd/l for 20 days, no loss of Cd from the shrimps could be measured in a period of 7 days. Accumulation factors were identical to those calculated for C. crangon living in the Elbe estuary. (EIS-Katz)
W79-02463

ON THE UPTAKE OF THREE DIFFERENT TYPES OF HYDROCARBONS BY SALMON EGGS (SALMO SALAR L.),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W79-02464

THE NUTRIENT CONTENTS OF NORTH SEA WATER: CHANGES IN RECENT YEARS, PARTICULARLY IN THE SOUTHERN BIGHT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
H. Postma.
Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration De La Mer, Vol. 172, p 350-357, 1978. 6 fig, 21 ref.

Descriptors: *Nutrients, *Phosphates, *Nitrates, *Silicates, Water chemistry, Water analysis, Seasonal, Growth rates, Phytoplankton, Diatoms, Chemical analysis, Primary productivity, Eutrophication, Trophic level, Productivity, *North Sea.

This paper reports the nitrate, silicate, and phosphate content of North Sea waters as well as basic parameters such as salinity, oxygen content, transparency and currents. Data is presented on seasonal variations and changes over the last 25 years. (EIS-Deal)
W79-02468

A METHOD OF PREDICTING THE BIOLOGICAL EFFECTS OF SYNTHETIC POLLUTANTS IN THE NORTH SEA,
Danmarks Fishkeri- og Havundersogelser, Charlottenlund.
For primary bibliographic entry see Field 5C.
W79-02470

GROWTH-INFLUENCING SUBSTANCES IN SEDIMENT EXTRACTS FROM A SUBTROPICAL WETLAND: INVESTIGATION USING A DIATOM BIOASSAY,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Biology and Living Resources.
For primary bibliographic entry see Field 5C.
W79-02476

ORGANCHLORINES IN CODFISH FROM HARBOURS ALONG THE NORWEGIAN COAST,
Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology.
For primary bibliographic entry see Field 5C.
W79-02479

THE POLLUTION OF SEA-WATER IN NAGASAKI BAY IN SUMMER 1976 AND 1977, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
S. Miyahare, and H. Ohno.
Bulletin of the Faculity of Fisheries, Nagasaki University, No. 45, p 29-31, 1978. 1 fig, 2 tab, 4 ref.

Descriptors: *Chemical oxygen demand, *Suspended solids, *Cadmium, *Lead, *Mercury, Organic compounds, Heavy metals, Sea water, Water quality, Water chemistry, Chemical analysis, Dissolved oxygen, Salinity, Water temperature, Hydrogen ion Concentration, *Arsenic, *Nagasaki Bay(Japan).

Following a previous report in 1975, we conducted an examination of the pollution of sea-water in Nagasaki Bay in summer 1976 and 1977 to check the environmental changes in the bay. Although chemical oxygen demand was inclined to decrease yearly, suspended solids increased considerably, probably because of the increased dust in the seawater. N-hexane extracts showed a trend of gradual increase. Cadmium and lead were detectd, though they were not detected in 1975. Mercury and arsenic decreased yearly during the period of this investigation. (EIS-Deal)
W79-02482

EFFECT OF BARITE (BASO4) ON DEVELOPMENT OF ESTUARINE COMMUNITIES,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W79-02484

INSECTICIDE PERSISTENCE IN NATURAL SEAWATER AS AFFECTED BY SALINITY, TEMPERATURE, AND STERILITY,
Gulf Coast Research Lab., Ocean Springs, MS. Microbiology Section.
W. W. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 605, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-78-044 April 1978, 25 p, 8 tab, 4 fig, 23 ref.

Descriptors: *Insecticides, Pesticides, *Chlorinated hydrocarbon pesticides, Phosphothionate pesticides, Water temperature, Sea water, Salinity, Sterility, *Malathion, *Parathion, *Methylparathion, *Diazinon, *Methyloxychlor, Gas chromatography, Degradation, Decomposition, Microbial degradation.

The effect of temperature, salinity, and sterility on the degradation of malathion, parathion, methyl parathion, diazinon, and methoxychlor in fresh and estuarine water has been determined under controlled laboratory conditions. Surface water samples of 1, 10, 20, and 28 ppt salinity were amended with the above insecticides and incubated in the dark at 30, 20, and 10C under sterile and nonsterile conditions. Insecticide abatement was followed by electron-capture gas-liquid chromatographic techniques. No significant differences between sterile and nonsterile treatments were observed for any of the insecticides studies, while the effect of increas-

ing temperature was highly significant with regard to increased degradation of malathion, parathion, methyl parathion, and diazinon. Methoxychlor reflected the recalcitrance characteristic of the chlorinated hydrocarbon insecticides throughout 84 days of incubation and was not significantly affected by salinity, temperature, or sterility. Salinity effects were varied among the four organophosphates, being highly significant for malathion and diazinon, significant for methyl parathion, and not significant for parathion. (EIS-Katz)
W79-02487

THE URQUIOLA OIL SPILL, LA CORUNA, SPAIN: IMPACT AND REACTION ON BEACHES AND ROCKY COASTS,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5C.
W79-02500

5C. Effects Of Pollution

SIGNIFICANCE OF NITRIFICATION IN STREAM ANALYSIS-EFFECTS ON THE OXYGEN BALANCE,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
M. S. Finstein, P. F. Strom, and V. A. Matulewich.
Journal of the Water Pollution Control Federation, Vol. 50, No. 8, August 1978, p 2055-2057. 1 fig, 12 ref.

Descriptors: *Nitrification, Streams, *Dissolved oxygen, *Biochemical oxygen demand, *Mathematical models, *Nitrogen fixing bacteria, Nitrogen cycle, Model studies, Bacteria, Plankton, Benthos, Grand River(MI), Michigan, Passaic River(NJ), New Jersey, Nutrients, Waste water disposal, Waste water treatment.

A retrospective critique of Courchaine's 1968 paper on effects of nitrification in streams on oxygen balance contends that nonplanktonic nitrifying organisms associated with the streambed probably account for the high rate of nitrification observed just below the wastewater treatment outfall in the Grand River, Michigan. In the study, the course of nitrate accumulation in the river below the outfall did not resemble the course of nitrification-induced oxygen uptake during laboratory incubations. In the river, nitrate accumulation was underway 0.05 days downstream and two-thirds of the effluent nitrogenous load was accounted for in terms of nitrate at a point 0.73 days downstream. Location of nitrifying bacteria in the receiving stream determines the appropriate type of mathematical stream model. An autocatalytic model is suitable for streams with planktonic nitrifyers, where nitrification is delayed until the nitrifying population expands in response to ammonium enrichments. For nonplanktonic nitrifiers, a model based on zero-order kinetics is appropriate; in this case nitrification begins immediately below outfall. Courchaine's paper clearly demonstrates that nitrification can be an important mechanism in removal of DO from receiving streams. (Lynch-Wisconsin)
W79-02001

THE EFFECTS OF WEED-CUTTING ON THE MACRO-INVERTERATE FAUNA OF A CANALISED SECTION OF THE RIVER HULL, A NORTHERN ENGLISH CHALK STREAM,
James Cook Univ. of North Queensland, Townville (Australia). Dept. of Zoology.
R. G. Pearson, and N. V. Jones.
Journal of Environmental Management, Vol. 7, No. 1, p 91-97, July, 1978. 4 tab, 8 ref.

Descriptors: *Environmental effects, *River Hull(England), *Mechanical control, *Aquatic weed control, *Invertebrates, *Aquatic animals, Chalk streams, England, Rivers, Canals, Drainage, Insects, Summer, Faunal lists, Ranunculus fluitans, Potamogeton, Cladophorea, Fish, Benthic fauna.

Cutting and removal of large amounts of vegetation and its associated invertebrate fauna from the River Hull, a chalk stream in northern England, resulted in: (1) removal of significant numbers of animals in the weeds, (2) an increase in activity of many benthic faunal species, and (3) increased drifting of some plant-dwelling animals. The increase in activity was probably due to both general habitat disturbance and influx to the bottom populations of animals escaping from the cut weed. Long-term effects are considered to be minimal, though effects could vary with the timing of cutting, and fish populations could be adversely affected by weed cutting. The operation referred to the great ability of stream communities to recover from disturbance. In the section of the canalized river investigated, the river had an approximate width of 20 m, a depth of 0.5-1.5 m, and current velocity of 10-20 cm/sec, and a substream of coarse sand and silt. A list of 26 taxa of fauna found on Ranunculus fluitans, Potamogeton spp, Cladophora sp., and several drifting plant species is given. Other common plant species include Ranunculus aquatilis, Fontinalis antipyretica, Oenanthe fluviatilis, Groenlandia densa, Ceratophyllum demersum, and Hippuris vulgaris. (Lynch-Wisconsin)
W79-02002

A SURVEY OF PHOSPHORUS AND NITROGEN LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5A.
W79-02003

AMMONIUM OXIDATION AND ITS SIGNIFICANCE IN THE SUMMER CYCLING OF NITROGEN IN OXYGEN DEPLETED SKAN BAY, UNALASKA ISLANDA, ALASKA,
Tokyo Univ. (Japan). Ocean Research Inst.
A. Hattori, J. J. Goering, and D. B. Boisseau
Marine Sciences Communications, Vol. 4, No. 2, p 139-151, 1978. 3 fig, 2 tab, 8 ref. NSF GA-37963.

Descriptors: *Skan Bay(AK), *Ammonium, *Oxidation, *Oxygen depletion, *Nitrogen, *Anaerobic conditions, Alaska, Denitrification, Bays, Cycling nutrients, Nitrites, Nitrates, Nutrients, Phytoplankton, Algae, Pycnocline, Biochemical oxygen demand, Bacteria.

A study in Skan Bay (Unalaska Island, Alaska) August 1972 showed that ammonium oxidation proceeds in the entire water column, including in the oxygen-depleted waters below 35 m. The daly amminium oxidation rate in the stagnant water below 35 m was estimated at 150 mg N/sq m/day from decreases in ammonium and 100 mg N/sq m/day from increases in nitrite and nitrate. Observations suggest the nitrite was produced by bacterial oxidation of ammonium, and the decrease in nitrate near the bottom shows sediments act as a nitrate sink in the summer. Nitrate was reduced to nitrite and ammonium in the near-bottom water, but at a less intensive rate than the ammonium oxidation. Four-day bottle incubation and tracer experiments using nitrogen-15 ammonium yielded results consistent with rates of ammonium oxidation estimated from 18-day observations of water column concentration changes. Rates of oxidation below 35 m were comparable to production of organic nitrogen by phytoplankton in the euphotic zone. A shallow sill at 10 m depth at the mouth of the bay's western arm retards water exchange between the inner and outer bay; maximum depth of the inner bay is 63 m. During summer a seasonal pycnocline at 25 m prevents vertical convention; water below 35 m is thereby effectively isolated. By late September near-bottom water is depleted of oxygen by biochemical oxygen utilization, and anoxic bacteria flourish which use nitrate and sulfate in respiration. (Lynch-Wisconsin)
W79-02004

EFFECTS OF FOREST WORKINGS ON STREAMFLOW AND WATER QUALITY (PART I),
Forestry and Forest Products Research Inst., Tokyo (Japan). Div. of Forest Influences.
N. Nakano.
Japan Agricultural Research Quarterly, Vol. 11, No. 4, p 246-253, October 1977. 7 fig, 1 tab, 4 ref.

Descriptors: *Forest watersheds, *Forest management, *Lumbering, *Environmenta effects, *Japan, *Streamflow, *Water pollution sources, Streams, Forests, Recreation, History, Evapotranspiration, Clear cutting, Infiltration, Interception loss, Precipitation, Runoff.

Major results of forest hydrological experiments conducted since 1935 at Japan's Forestry and Forest Products Research Institute are outlined. Streamflow and water quality are affected by activities as forest planting, herbicide spraying, fertilization, road building, recreation, and most importantly, logging. Recreation is likely to cause the major future problems. Two types of experiments are reported: (1) hydrological functioning of forests (interception loss, evapotranspiration, and infiltration capacity of forest land), and (2) effects of forest use on runoff (effects of clear cutting on water yield, high streamflow, and low streamflow; reasons for changes in high streamflow after cutting; and the relationship between forest vegetation and high and low streamflow). Interception loss varied with forest type, precipitation, and other climatic conditions, and for a coniferous forest canopy loss was 15-20% annual net precipitation, under-growth loss was about 1 mm/storm, and liter loss was 2-4 mm. Evapotranspiration accounted for mean annual water loss of 400-1100 mm for 6.6-645 ha mixed forest watersheds. Clear cutting and logging increased annual runoff and its percentage of annual precipitation; runoff increases ranged 10-45%. Quickflow increased after cutting, due in part to increased surface runoff resulting from compaction by logging. Low streamflow increases are probably due to diminished transpiration after cutting. (Lynch-Wisconsin)
W79-02005

A DYNAMIC LAKE MODEL FOR TROPHIC STATE PREDICTION,
Eidgenoessische Anstalt fuer Waserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
D. M. Imboden, and R. Gachter.
Ecological Modelling, Vol. 4, No. 2-3, 77-98, 1978. 9 fig, 5 tab, 16 ref.

Descriptors: *Trophic level, *Lakes, *Mathematical models, *Primary productivity, *Phosphrous, *Eutrophication, *Simulation analysis, Lake restoration, Forecasting, Dynamic models, Phosphates, Nutrients, Algae, Phytoplankton, Switzerland, Washington, Lake Washington(WA), Alpnachersee(Switzerland), Greifensee(Switzerland), Time, Depth, Aeration, Destratification, Hydraulic residence time, Diversion, Water pollution effects, Diffusion.

A dynamic, one-dimensional vertical model for phosphate and particulate phosphrous simulates the relationship between phosphrous loading and primary production per unit lake area, as a measure of a lake's trophic state. Primary production per unit lake area is described by a nonlinear function of phosphate and particulate phosphorus which accounts for Michaelis-Menten saturation and algal self-shading. The model includes lake morphometry, hydraulic loading, respiration rate, sedimentation, vertical eddy diffusion, thermocline depth, and phosphorus exchange at the sediment-water interface. The model was applied to Alpnachersee and Greifensee in Switzerland and Lake Washington in Washington state, and good agreement was found between observation and the calculation of phosphorus variations as a function of time and depth. The calibrated model predicted the effectiveness of various eutrophication control measures, such as reduction of phosphrous loading, discharge of hypolimnetic water, hypolimnion aeration, and destratification. For Greifensee, with a mean residence time of 1.2 years, reduction in phosphorus loading to 20% current level is needed to achieve permanent aerobic conditions throughout the lake; other measures result in only minor improvements. The model simulates well the observed recovery of Lake Washington following sewage diversion 1963-67. (Lynch-Wisconsin)
W79-02006

EXAMINATION OF A LAKE MODEL,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen, H. Mejer, and M. Friis.
Ecological Modelling, Vol. 4, No. 2-3, p 253-278, 1978. 11 fig, 12 tab, 23 ref.

Descriptors: *Eutrophication, *Mathematical models, *Lyngby Lake(Denmark), *Glumso Lake(Denmark), *Simulation analysis, *Lakes, Model studies, Computer programs, Denmark, Nutrients, Parameters, Waste water disposal, Water pollution effects, Dynamic models, Phosphorus, Nitrogen, Organic matter, Forcing functions, Environmental effects, Ecosystems, Equations.

A eutrophication model previously described and calibrated is further validated and recalibrated with data from Lyngby and Glumso Lakes, Denmark. Glumso Lake was used in the original study, and the present paper makes use of an additional year of data from that lake. Lyngby Lake received treated wastewater 1952-58, which contained a high nutrient concentration. The model was used to simulate changes in Lyngby Lake 1959-75 following diversion of the wastewater to the sea in 1959. The model closely describes the lake's response, and generally appears to accurately represent long-term changes and changes in average and maximum values caused by alterations in forcing functions. The model needs to be improved for use in describing annual cycles, but can be used for setting up environmental impact statements. Some aspects of the model were modified to permit investigation of effects of applying submodels which better describe actual ecosystem processes. Sensitivity analysis of one modification was carried out to estimate the importance of parameters, and results were used to calibrate the model more systematically. An automatic computer calibration was tested on four versions of the model, and a subsequent validation was compared with each version. An itemized list is given of state variables, differential equations, rates, limiting factors, other equations, parameter values, and forcing functions of model II. (Lynch-Wisconsin)
W79-02007

A SIMULATION MODEL FOR PHYTOPLANKTON GROWTH AND NUTRIENT CYCLING IN EUTROPHIC, SHALLOW LAKES,
N. Nyholm.
Ecological Modelling, Vol. 4, No. 2-3, p 279-310, 1978. 5 fig, 7 tab, 30 ref.

Descriptors: *Lakes, *Phytoplankton, *Mathematica models, *Cycling nutrients, *Eutrophication, *Simulation analysis, *Water management(Applied), Denmark, Shallow water, Model studies, Phosphorus, Nitrogen, Algae, Plant growth, Nutrients, Dynamic models, Guden River Basin(Denmark), Funen Island(Denmark), Limiting factors, Seasonal, Forecasting, Primary productivity, Sewage disposal, Retention time.

A dynamic model which simulates phytoplankton growth and phosphorus and nitrogen cycling in shallow eutrophic lakes give reasonably good results, at least for lakes with short hydraulic retention times. The model is intended only to describe average conditions over a time scale of several days. It describes a seasonal cycle in a lake assumed to be in equilibrium regarding nutrient inputs for one year and predicts future equilibrium for effects of altered inputs. The model is relatively simple and data requirements are fairly modest; it is designed primarily for practical application, and may be used for environmental management. It has been used to simulate 12 Danish lakes, seven on the island of Funen and five in the Guden River basin. Two of the latter were subdivided, Lake Silkeborg Langsoe into three boxes and Lake Tange into two. Most parameter values were common to all simulations, while a few key parameters were allowed to vary somewhat. Where larger deviations were necessary, reasonable explanations could usually be given. Parameter values and selected numerica results (such as primary productivity) are given for all simulations performed. Simulations of Lakes Braendegaard, Noerre, and Arreskov were unsatisfactory because it was forseen that nitrogen would become a growth-limiting factor. (Lynch-Wisconsin)
W79-02008

ORGANISM PATCHINESS IN LAKES RESULTING FROM THE INTERACTION BETWEEN THE INTERNAL SEICHE AND PLANKTONIC DIURNAL VERTICAL MIGRATION,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
D. Kamykowski.
Ecological Modelling, Vol. 4, No. 2-3, p 197-210, 1978. 7 fig, 15 ref.

Descriptors: *Vertical migration, *Seiches, *Plankton, *Diel migration, *Lakes, *Computer models, Patchiness, Distribution, Zooplankton, Phytoplankton, Equations, Model studies, Computer programs, Windemere(England), England, Stratification, Winds, Predation, Pycnocline, Algae.

Computer models tested Colebrook's conclusion (in a 1960 study of the Windemere, England internal seiche) that wind and the internal seiche combined with diurnal vertical migration of plankton through the thermocline should have a permanent effect on the horizontal distribution of organisms. The observed temporal and spatial patchiness of organisms is influenced by : (1) sampling interval, (2) frictional damping of the basin, (3) phase angle between the seiche and the daylight cycle of vertical migration, (4) organism behavior patterns, and (5) organism swimming speed. Migrating organisms that exclusively reside in either the epilimnion or hypolimnion are affected by currents in the respective layers; the resulting horizontal patchiness is temporary since these organisms maintain a continuous relationship with the same water column. Organisms that cross between layers during their diurnal vertical migration change water columns with each transit and thus can form permanent patches. In Windemere these permanent patches daily vary in strength depending on the current exposure experienced by organisms capable of various swimming speeds. Predator-prey encounters between phytoplankters swimming at 1.5 m/hr and zooplankters swimming at 4 m/hr were investigated. These migration interactions may have an important effect on growth and survival of phytoplankton or zooplankton populations. (Lynch-Wisconsin)
W79-02009

EFFECTS OF NITRATE CONCENTRATION ON THE GROWTH AND PHYSIOLOGY OF LOMINARIA SACCHARINA (PHAEOPHYTA) IN CULTURE,
Dalhousie Univ., Halifax (Nova Soctia). Dept. of Biology.
A. R. O. Chapman, J. W. Markham, and K. Luning.
Journal of Phycology, Vol. 14, No. 2, p 195-198, 1978. 5 fig, 1 tab, 16 ref.

Descriptors: *Nitrates, *Laminaria saccharina, *Plant growth, *Plant physiology, *Limiting factors, *Nutrients, Nitrogen, Carbon, Chlorophyll, Phaeophyta, Algae, Cultures, Half-saturation constant, Photosynthesis, Satuartion, Helgoland(West Germany), West Germany, St. Margaret's Bay(Nova Scotia Canada), Canada, Nova Scotia(Canada), North Sea, Seas, Bays, Solar radiation.

The growth response of the brown alga Laminaria saccharina to various nitrate concentrations in laboratory culture was approximately linear up to 10 microM substrate concentration. The half-saturation constant (K sub s) was about 1.4 microM NO3. Internal nitrate levels increased at substrate concentrations above 10 microM NO3 and reached levels several thousand times higher than the surrounding medium, indicating luxury nitrate consumption. Chlorophyll content and photosynthetic capacities of the plants also increased with increasing external nitrate. Sporophytes of L. saccharina were grown in flow-through enriched and synthetic media with nitrate concentrations of 0,3,10,20,100, and 500 microM. Gametophytes were obtained from parental saturation level for growth (about 10 microM NO3) is within the range found at Helgoland. In the experiments at the two flow rates tested (3.3 and 1.6 liters/day) growth rates were not significantly different. Comparison of the results to Laminaria populations in St. Margaret's Bay, Nova Scotia, Canada, suggests that in winter, light is the limiting factor since nitrate is stored internally, but nitrate is probably limiting in spring and summer when irradiance increases. (Lynch-Wisconsin)
W79-02010

POTENTIAL IMPORTANCE OF BENTHIC CYSTS OF GONYAULAX TAMARENSIS AND G. EXCAVATA INITIATING TOXIC DINOFLAGELLATE BLOOMS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
Journal of Phycology, Vol. 14, No. 2, p 224-234, 1978. 21 fig, 3 tab, 28 ref.

Descriptors: *Red tide, *Gonyaulax tamarensis, *Gonyaulax excavata, Hypnocysts, *Growth stages, *Reproduction, Cysts, Algae, Phytoplankton, Dinoflagellates, Eutrophication, Estuaries, *Cape Cod(MA), Massachusetts, Toxicity, Toxins, Chelation, Motility, Light, Canada, New England, Pellicle cyst, Plant growth, Life cycles, Sediments.

Thick-walled, nonmotile cysts ('hypnocysts') of two toxic, red tide dinoflagellates isolated from estuarine sediments at Cape Cod, Massachusetts are concluded to be important in seeding the recurrent annual blooms, synchronizing early bloom development with vernal warming of seawater, and increasing the geographic range of the species. The species were identified as Gonyaulax tamarensis (Falmouth district) and G. excavata (Orleans district) after the hypnocysts were germinated to produce their motile, thecate stages. Laboratory incubation of the hypnocysts at 16 C, which had been stored in the dark at 5 C for 6 mo, initiated excystment by the temperature increase, with no appreciable effect from light regime, nutrient, or chelator concentrations. Germling motility was optimum in highly chelated medium and eastern Canadian waters are initiated through the displacement of motile estuarine populations into nearshore areas by tidal advection and surface runoff, although the potential existence and importance of offshore cyst reservoirs cannot be discounted. Evidence is presented that hypnocysts are probably sexual zygotes, whereas the thin-walled cysts readily formed in laboratory cultures (pellicle cysts) are asexual. Pellicle cysts are of limited durability, do not overwinter in nature, and therefore do not play a significant role in initiating toxic blooms. (Lynch-Wisconsin)
W79-02011

TROPHIC STRUCTURE MODIFICATIONS BY PLANKTIVOROUS FISH IN AQUATIC MICROCOSMS,
California Univ., Berkeley. Lawrence Berkeley Lab.
A. Jassby, J. Rees, M. Dudzik, D. Levy, and E. Lapan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 342, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/7-77-096, August 1977. 18 p, 2 tab, 14 ref. EPA-IAG-DS-E681/Contract No. 77BCC.

Descriptors: *Trophic level, *Fish, *Planktivores, *Eutrophication, *Zooplankton, *Predation, *Food webs, Phytoplankton, Algae, Mosquito fish, Gambusia affinis, Simocephalus vetulus, Alona guttata, Cladocera, Grazing, Rotifers, Carbon, Nitrogen, Phosphorus, Nutrients, Organic compounds, Inorganic compounds, Chlorophyll, Anabaena, Research equipment, Microcosms.

Addition of two 2.5-cm zooplanktivorous mosquito fish (Gambusia affinis) to two of four 700-liter freshwater microcosms shifted zooplankter dominance from the large cladoceran Simocephalus vetulus to the smaller Alona guttata. The resultant decrease in grazing pressure raised phytoplankton

and bacteria levels, in turn increasing rotifer biomass. In tanks with Gambusia, particulate organic carbon concentration was higher and dissolved inorganic nitrogen concentration lower than in the controls, reflecting a net shift of nutrients from inorganic to organic, presumably due to smaller zooplankton respiratory losses. In the microcosms with fish, ratios of particulate to dissolved organic carbon, and of phytoplankton carbon, and of phytoplankton carbon to chlorophyll-a, were unnaturally high. In all four systems there was an increase in total nitrogen, probably caused by heterocystous Anabaena sp and not by the presence of Gambusia. Each microcosm, consisting of a fiberglass cylinder 1.2 m in diameter, was filled to a depth of 60.1 cm with demineralized water, then enriched with a modified common freshwater algal growth medium and inoculated with a 3.5-liter water sample from small, eutrophic Lake Anza in Berkeley, California. Nutrient enrichment levels are sufficient for eventual nitrogen limitation of algal growth, and the initiation conditions give rise to a phytoplankton bloom that is terminated by zooplankton grazing within two months. (Lynch-Wisconsin)
W79-02013

ROLE OF INORGANIC IONS IN CONTROLLING SEDIMENTATION RATE OF A MARINE CENTRIC DIATOM DITYLUM BRIGHTWELLI,
California Univ., Santa Barbara. Dept. of Biological Sciences.
L. W. J. Anderson, and B. M. Sweeney.
Journal of Phycology, Vol. 14, No. 2, p 204-214, 1978. 14 fig, 3 tab, 50 ref. NSF GB-35247.

Descriptors: *Ditylum brightwelli, *Ion transport, *Sedimentation rates, *Diel migration, *Biorhythms, *Diatoms, Algae, Inorganic compounds, Ions, Marine algae, Centric diatoms, Potassium, Sodium, Chlorine, Magnesium, Calcium, Photoperiodism, Darkness, Light, Buoyancy, Vacuoles, Settling velocity, Phytoplankton.

The settling rate of the marine centric diatom Ditylum brightwelli is shown to be controlled by intracellular levels of potassium, sodium, and chlorine ions; no significant change in magnesium or calcium ions was found. Cells at the end of the dark period had high sodium (118 mM), low potassium (64 mM), and low chlorine (117 mM) ion levels compared with levels at the end of the light period when sodium was low (101 mM), and potassium, (126 mM) and chlorine (154 mM) were high. Magnesium (16-18 mM) and calcium (3-4 mM) remained relatively unchanged. The net result of the ion changes during the light period is to increase cell density by about 3.4 mg/ml, which can account for the increase in settling rate of about 0.3 m/day during the same interval. The density of the cell contents, calculated from observed ion concentrations, is 15-18 mg/ml less than that of the seawater medium. The ion and settling rate changes are light-dependent and do not persist in the dark or under constant light (about 850 lx), but cells do exhibit a free-running circadian rhythm in cell division under continuous dim illumination. The cell vacuole expands during the light period and contracts during the dark, apparently in response to the net ion fluxes. D. brightwelli appears to regulate its density by active ion selectivity accompanied by trans-vacuolar water movement. Axenic batch cultures of the alga were maintained in three-liter flasks containing 1-1.5 liters of enriched seawater medium IMR at 20C on an 8:16 light-dark cycle. (Lynch-Wisconsin)
W79-02014

KINETICS OF PHOSPHATE UPTAKE BY AQUATIC MICROORGANISMS: DEVIATIONS FROM A SIMPLE MICHAELIS-MENTEN EQUATION,
Wisconsin Univ.-Madison. Dept. of Soils.
E. J. Brown, R. F. Harris, and J. F. Koonce.
Limnology and Oceanography, Vol. 23, No. 1, January 1978, p 26-34. 5 fig, 1 tab, 38 ref. NSF AG-199 BMS76-00761 193-69.

Descriptors: *Kinetics, *Michaelis-Menten equations, *Phosphates, *Absorption, *Microorganisms, *Eutrophication, Equations, Selenastrum capricornutum, Algae, Phytoplankton, Inorganic compounds, Radioisotopes, Lake Wingra(WI), Wisconsin, Bioassay, Mathematical studies.

Uptake kinetics of dissolved inorganic phosphate (31P sub i) by lake water microorganisms and by the green alga Selenastrum capricornutum determined as a function of uptake rates of radiophosphate (32P sub i), at added 31P sub i levels > or = 0, did not follow a simple Michaelis-Menten equation. The equation used was: C/v* = A/V + (K sub v + S sub n)/V. Axenic cultures of S. capricornutum were maintained in PAAP medium, and large volumes of water from the surface of small, eutrophic lake Wingra (Madison, Wisconsin) were used for 31P sub i uptake kinetic evaluations. For the lake water sample, deviations of 31P sub i uptake from the equation shown by the curvilinear responses of the plots of C/v* vs. A can be interpreted as caused by the presence of different microorganisms with varying half-saturation constants for uptake of 31P sub i. Similarly, such a curvilinear response for the axenic green alga is consistent with its having more than one system for phosphate uptake, with differing half-saturation constants. While uptake rates obtained from high level 31P sub i-perturbation experiments are generally hyperbolic versus the added 31P sub i uptake rates as estimated by back-extrapolations assuming adherence to a simple Michaelis-Menten equation must be otherwise verified. This is particularly true for the very low 31P sub i levels common in 31P sub i-limited aquatic ecosystems. (Lynch-Wisconsin)
W79-02016

A MATERIAL BALANCE STUDY OF POLYCHLORINATED BIPHENYLS IN LAKE MICHIGAN,
Dow Chemical Co., Midland, MI. Environmental Science Research Lab.
W. B. Neely.
The Science of the Total Environment, Vol. 7, p 117-129, 1977. 1 fig, 4 tab, 22 ref, 1 append.

Descriptors: *Lake Michigan, *Polychlorinated biphenyls, *Mathematical models, *Water pollution source, *Sediment-water interfaces, Model studies, Absorption, Deposition(Sediments), Chemical degradation, Distribution patterns, Estimating equations, Path of Pollutants, Industrial wastes.

A proprietary study was made (1) to identify possible input sources necessary to maintain observed polychlorinated biphenyl (PCB) levels in the Lake Michigan biomass; and (2) to develop a mathematical model that could predict trends in distribution of these chemicals introduced into the lake environment. By integrating known chemical and physical properties of PCB with a mathematical model describing their behavior in the lake the following conclusion was reached: Persistent high levels of PCB in Lake Michigan are not caused by municipal or industrial waste discharge, or fall-out from rain and snow, but are the result of PCB released from lake bottom sediments. Prior to 1970 there was a large input of PCB into Lake Michigan. Due to inertness and high absorption coefficient, the material accumulated in bottom sediments. Since 1970, with a decrease of dispersive uses, the accumulated material is now serving as a major input source into the water. Due to the long time constants it will take several years for the Lake Michigan ecosystem to clean itself. The main factor behind this cleansing action is the concentration gradient that exists in the air/water interface (Harris-Wisconsin)
W79-02017

APPLICATION OF A MODEL OF ZOOPLANKTON COMPOSITION TO PROBLEMS OF FISH INTRODUCTIONS TO THE GREAT LAKES.
State Univ. of New York at Albany Dept. of Biological Sciences.
D. C. McNaught, and D. Scavia.
Rensselaer Fresh Water Institute Report No. 77-4, 1977. 4 fig, 5 tab, 30 ref. Also in: Modeling Biochemical processes in Aquatic Ecosystems, p. 281-304. 4 fig, 5 tab, 30 ref. NSF AG-199, BMS 69-01147-A09.

Descriptors: *Lake Michigan, *Lake Ontario, *Mathematical models, *Predation, *Fish, *Zooplankton, *Simulation analysis, Eutrophication, Succession, Species composition, Great Lakes, Lakes, Alewife, Alosa pseudoharengus, Bosmina longirostris, Daphnia, Diaptomus, Simulation analysis, Model studies, Water management(Applied), Seasonal, Size, Detritus, Food habits, Algae, Phytoplankton, Population dynamics, *Bioindicators.

A simple two-equation model was used to examine the relative importance of size selection by fish predators on zooplankton in Lakes Michigan and Ontario, as well as effects of nonuniform seasonal inshore distribution of the fish upon both zooplankton composition and abundance. The simulations imply that: (1) fish predation is the principal factor controlling zooplankton composition, (2) Bosmina logirostris is an indicator of predatory pressure and not solely of advanced eutrophication or shifts to larger algal species, and (3) inshore alewife (Alosa pseudoharengus) spawning populations in May and June largely determine summer zooplakton composition. Model inputs include: (1) available phytoplankton and detrital food resources, (2) food selectivity of zooplankton, and (3) size-selective predation by fishes (fish biomass times selectivity) Fish predation is the primary determinant of zooplankton species succession, while algal productivity influences relative species abundance. The model's real-time output can easily be used to determine when the system had reached steady-state, the main criterion in determining when to examine community composition; the output provides estimates of zooplankton and resource numbers at intervals. The model as calibrated for Lake George, New York (reported elsewhere), and is used here to simulate predation by alewife (and salmonids in Lake Michigan prior to 1954) on three common crustaceans: Diaptomus spp, Daphnia spp, and B. longirostris. (Lynch-Wisconsin)
W79-02020

PREDICTION OF PHYTOPLANKTON PRODUCTIVITY IN LAKES.
Environmental Monitoring and Support Lab., Las Vegas, NV.
V. W. Lambou, L. R. Williams, S. C. Hern, R. W. Thomas, and J. D. Bliss.
In: Report EPA 600-9-76-016, Proceedings of the Conference on Environmental Modeling and Simulation, p 696-700, July 1976. 1 tab, 26 ref.

Descriptors: *Classification, *Lakes, *National Eutrophication Survey, *Phytoplankton, *Chlorophyll, *Primary productivity, *Eutrophication, *Phosphorus, Algae, Forecasting, Hydrology, Hydraulic residence time, Nutrients, Ammonia, Parameters, Limiting factors, Nitrogen, Stratification, Macrophytes, Water pollution effects, Trophic levels, Reservoirs, Bioassay.

1972 National Eutrophication Survey data were used to help establish lake classes and determine relationships between ambient nutrients and lake water quality by lake type. Phosphorus correlated most strongly with phytoplankton productivity as measured by yearly mean chlorophyll-a levels Sixty-nine lakes were classified as phosphorus-limited (N/P >14), 44 as transitional (N/P between 10-14), and 79 as nitrogen-limited (N/P <10) Chlorophyll-a development increased with hydraulid retention time (RT) up to about 14 days; at RT 14, 71% of the variation in chlorophyll-a was explained by changes in total phosphorus (TP) levels. Chlorophyll-a correlations with dissolved phosphorus (DP) resembled total phosphorus correlations, but were lower in all subpopulations. TP-DP/chl-a ratios were consistent between freshwater and marine communities according to comparisons with other studies. TP is a good approximaton of bioavailable phosphorus. Of nitrogen forms, ammonia-nitrogen (NH) was most strongly correlated with mean chl-a, but (with other dissolved nitrogen forms) was strongest in phosphorus-limited lakes, declined in transitional lakes, and

was very weak in nitrogen-limited lakes. The relationship of pH and alkalinity to chl-a was much stronger in phytoplankton- than macrophyte-dominated lakes. Turbidity and Secchi disc were negatively correlated with chl-a. Stratification had little effect on most parameters except ammonia and nitrite-nitrate-nitrogen. (See also W77-09154) (Lynch-Wisconsin)
W79-02055

P-32 UPTAKE IN LENTIC ALGAE,
Georgia Inst. of Technology, Atlanta. School of Biology.
J. R. Strange, G. D. Williamson, and D. J. Fletcher.
Environmental Letters, Vol. 9, No. 1, p 1-5 1975. 4 fig, 4 ref. OWRT A-035-GA(2), 14-31-0001-3510.

Descriptors: *Algae, Phosphorus radioisotopes, Nostoc, *Absorption, Lakes, Eutrophication, *Georgia, *Lake Sidney Lanier(Geo), *P-32 uptake, Chlorococcum, Fragillaria, Eutropic lakes.

A study of the Flat Creek Embayment of Lake Sidney Lanier near Gainesville, Georgia revealed three genera of algae, Chlorococcum, Fragillaria and Nostoc, to be prominent in this eutrophic region of the lake. The algae were grown in phosphate-rich media and subsequently labelled with P-32. All species incorporated luxury amounts of phosphorus as determined by the uptake of P-32. The results indicate that the P-32 uptake is proportional to the surface-per-volume ratio. The higher surface-per-volume ratio resulted in greater uptake of P-32.
W79-02078

AMINO ACIDS IN SALT MARSH DETRITUS,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
A. A. de la Cruz, and W. E. Poe.
Limnology and Oceanography, Vol. 20, No. 1, p 124-127, January, 1975. 2 tab, 12 ref.

Descriptors: *Amino acids, *Salt marshes, *Detritus, *Marsh plants, Vegetation, Nutrients, Degradation, Decomposing organic matter, Proteins, Nitrogen, Estuaries, Marshes.

Amino acids declined by more than 50% on death of marsh plants, but increased again almost to the level of the living plant during in situ decomposition. A decline in the ratio of total amino acid to crude protein in spite of increases in both amino acids and crude proteins implies nitrogen sources in the marsh other than the amino acids and ammonia in the plants. Suspension feeders may be exposed to food particles of even higher nutrient level than are the grazers on the marsh plants. The analyses support the general observation that estuarine detritus may be a food source of high nutritional value. (Maroncelli-Mass)
W79-02086

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
F. O. Anderson.
Oikos, Vol. 27, No. 2, p 243-250, 1975.

Descriptors: *Primary productivity, *Rooted aquatic plants, Aquatic plants, Phytoplankton, Lakes, Wetlands, *Denmark, Reeds, Eutrophication, Eutrophic lakes.

Phytoplankton gross primary production (C14 method) in the shallow, eutrophic Danish Lake Arreso in 1973 was 980 g C/sq m; calculated net primary production was near zero. Marcophyte net primary production of the reed swamp was measured by harvesting the maximum biomass at three localities dominated by Phragmites or Scirpus. Above ground values were between 420 and 1325 g ash free dry wt/sq m, while below ground values were between 2480 and 8570 g ash free dry wt/sq m. The reed swamps were mapped on aerial photographs, and the composition of the macrophyte vegetation was determined. A comparison of macrophyte vegetation in 1944 and 1972 showed a reduction in species diversity, especially of submerged species. (Stihler-Mass)
W79-02103

APPARENT USE OF SEDIMENT NITROGEN AND PHORPHORUS BY PLANTS IN MALLETTS CREEK MARSH WITH IMPLICATIONS TO LAKE CHAMPLAIN WATER LEVEL REGULATION,
Geological Survey, Albany, NY.
For primary bibliographic entry see Field 2H.
W79-02115

EFFECTS OF SIMULATED FLOODING ON ALLIGATOR EGGS,
Louisiana Wildlife and Fisheries Commissionm, Grand Chenier.
For primary bibliographic entry see Field 2L.
W79-02116

LIMNOLOGY OF SELECTED LAKES IN OHIO - 1975,
Geological Survey, Columbus, OH., Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-02126

WATER QUALITY IN THE OLD PLANTATION WATER CONTROL DISTRICT, BROWARD COUNTY, FLORIDA-PROGRESS REPORT, JULY 1976-JUNE 1977,
Geological Survey, Tallahassee, FL., Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02127

SEDIMENTATION IN HOT CREEK IN VICINITY OF HOT CREEK FISH HATCHERY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W79-02128

MACROINVERTEBRATE SAMPLING TECHNIQUES FOR STREAMS IN SEMI-ARID REGIONS: COMPARISON OF THE SURBER METHOD AND A UNIT-EFFORT TRAVELING KICK METHOD,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5A.
W79-02146

STORM DERIVED LOSSES OF PHOSPHORUS AND THEIR SIGNIFICANCE TO ANNUAL PHOSPHORUS EXPORT FROM TWO NEW JERSEY WATERSHEDS,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W79-02151

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
B. W. Vigon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 683, Price codes: A14 in paper copy, A01 in microfiche. M.S. Thesis, 1976. 290 p, 35 fig, 41 tab, 278 ref, 3 append. OWRT A-061-WIS(2), 14-31-0001-3850, 14-31-0001-5050.

Descriptors: *Silica, *Phosphorus, *Diatoms, *Eutrophication, *Wisconsin, Lakes, *Algal control, *Nuisance algae, Water pollution effects, Water pollution control, *Lake Mendota(Wis).

The role of the vernal diatom population in the removal of P and Si from the lake water was evaluated for Lake Mendota, Madison, Wisconsin in 1974. Measurements were made of total and dissolved reactive P and Si (DRP and DRSi) in the lake water as a function of depth over the period from ice-out (March 3) to the development of thermal stratification (June 3). The amounts of P and Si in the lake water decreased markedly between March 3, and May 1. This time period corresponded to the development and sedimentation of the vernal diatom population. Maximum apparent removals of DRP and DRSi were about 40 and 94%, respectively. Corresponding values for removal of total P and diatom Si were 21 and 72%, respectively. Following sedimentation, mineralization of the diatom population apparently contributed to an increase in the levels of both P and Si in the lake water. Through a combination of field and laboratory measurements, the inputs of Si and P from the drainage basin and the bottom sediments and the losses via outflow were estimated. Using this information and the apparent removal values, the net amounts of P and Si removed by the diatom population were estimated. The net amounts prior to thermal stratification were 62% for DRP and 72% for DRSi. The results show that the vernal diatom population can substantially reduce the amounts of P available to support the growth of nuisance blue-green algae during the summer. (Armstrong-Wis)
W79-02152

THE EFFECTS OF STORM EVENTS ON THE ANNUAL PHOSPHORUS TRANSPORT IN SIX-MILE RUN,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W79-02153

EFFECT OF ANTIMYCIN ON STREAM INSECTS IN FIELD AND LABORATORY TRIALS,
Wisconsin Univ.-Madison. Dept. of Entomology.
P. M. Kotila.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 700, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, 1978. 107 p. 11 fig, 12 tab, 192 ref, 1 append. OWRT A-073-WIS(1), 14-34-0001-7106, 14-34-0001-8053.

Descriptors: *Fish control agents, *Piscicides, *Aquatic insects, *Invertebrates, *Toxicity, *Antimycin, *Bioassay, Water beetles, Dragon flies, Larvae, Lethal limit, Water pollution effects, Caddisflies, Stoneflies, *Tipula, *Mayflies, Fishfly larvae, Snipefly larvae.

The toxicity of antimycin to 38 species of Wisconsin stream insects was evaluated in static, aerated bioassays utilizing antimycin exposures typical of stream treatments used to kill fish. Several species of Trichoptera, Ephemeroptera and Plecoptera were very sensitive to fish killing concentrations of antimycin (EC-50 less than 50 ppb). Beetles (Psephenus herricki, Optioservus fastiditus, Stenelmis crenata, Helichus striatus, dragonfly nymphs (Neurocordulia molesta, Gomphurus vastus), damselfly nymphs (Argia apicalis), fishfly larvae (Nigronia serricornis), and snipe fly larvae (Atherix variegata) were relatively unaffected by anticmycin (EC-50 greater than 1,000 ppb). Early instars of Tipula spp. and Ephemerella sp. were more sensitive to anticmycin than later instars. Exposure to antimycin produced greater mortality at 19C than at lower temperatures in several species, even though exposure times were reduced at the higher temperature. Post-exposure observations indicated mortality may be delayed more than five days, particularly at reduced temperatures. Large differences in antimycin sensitivity were found for different species belonging to the same family (hydropsychid caddisflies, perlid stoneflies). Emergence of several species of stream insects was reduced or prevented by exposure of the mature larvae or nymphs to sublethal concentrations of antimycin. Pycnopsyche guttifer emerged successfully following exposure of the pupae to an antimy-

cin concentration just below that which killed the larvae. (Hilsenhoff-Wis)
W79-02156

THE CHARACTERIZATION OF BACILLUS CAPABLE OF BLUE-GREEN BACTERICIDAL ACTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5D.
W79-02159

PROCEEDINGS OF THE INTERSTATE SEAFOOD SEMINAR OCTOBER 4-7, 1977.
Virginia Polytechnic Inst. and State Univ., Hampton. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5G.
W79-02163

ENVIRONMENTAL IMPACT ASSESSMENT: AN AQUATIC BIOLOGIST'S POINT OF VIEW,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 6G.
W79-02222

SEASONAL FLUCTUATION OF WATER QUALITY (NUTRIENTS AND PIGMENTS) IN LOWER DELAWARE BAY,
Delaware Univ., Lewes. Marine Studies Complex.
D. Maurer, L. Watling, D. Bottom, and A. Pembroke.
Hydrobiologia, Vol. 60, No. 3, p 203-211, 1978. 8 fig, 1 tab, 17 ref.

Descriptors: *Delaware Bay, *Water quality, *Basic data collections, *Seasonal, *Nutrients, *Pigments, *Bays, *Estuaries, Mid-Atlantic Bight, Chlorophyll, Salinity, Water temperature, Dissolved oxygen, Silicates, Nitrates, Nitrites, Orthophosphate, Ammonia, Phaeopigments, Carotenoids, Baseline studies, Marshes, Chesapeake Bay, Raritan Bay,Narrangansett Bay(RI), Long Island Sound,

May 1974-May 1975 baseline data show that the lower Delaware Bay estuary is similar to other estuaries and bays in the mid-Atlantic bight in regard to seasonal fluctuations of nutrients and pigments. The first set of seasonal water quality baseline date for the bay indicates nutrient and pigment concentrations reflect seasonal nutrient patterns in the marshes to a certain degree. All of the estuaries compared, including Delaware, Narrangansett, Raitan, and Chesapeake Bays, and Long Island Sound, had high dissolved oxygen (DO) in winter, and most had undersaturated DO in summer, except Long Island Sound which was high in winter. Pigment concentrations were similar among the estuaries, but seasonal peaks varied. Nitrate, nitrate and inorganic phosphate levels in Delaware Bay were closest to those of Chesapeake Bay. Lower Delaware Bay did not show excess nutrient pollution, based on nitrogen/phosphorus ratios. In Delaware Bay surface and bottom water samples were analyzed for temperature, salinity, DO, silicate, nitrate, and nitrite, orthophosphate, ammonia, chlorophylls-a,-b, and-c, phaeopigments, and carotenoids. Salinity ranged from 22.9-29.7%, and DO from 4.53-8.53 ml/1. Silicate (30.3 micrograms-at/1) and orthophosphate (1.59) were highest in September; ammonia in July (6.8); nitrate and nitrite in January (24.27), February (18.2), and May (16.37); and chlorophyll-a in August (17.2), October (15.7), and March (15.33). (Lynch-Wisconsin)
W79-02223

PHOTOSYNTHETIC RATES OF MARINE ALGAE AS A FUNCTION OF INORGANIC CARBON CONCENTRATION,
Hawaii Inst. of Marine Biology, Honolulu.
J. Caperon, and D. F. Smith.
Limnology and Oceanography, Vol 23, No. 4, p 704-708, July 1978. 2 fig, 1 tab, 14 ref.

Descriptors: *Carbon, *Inorganic compounds, *Photosynthesis, *Marine algae, *Phytoplankton, *Michaelis-Menten equations, *Sea water, Algae, Nutrients, Estuaries, Port Hacking estuary(Australia), Australia, Dinoflagellates, Diatoms, Amphidinium carterae, Chlorella vulgaris, Phaeodactylum tricornutum, Inorganic carbon, Axenic cultures.

The relationship between phytoplankton growth rate in seawater and inorganic carbon concentration is quantatively described for the first time, and applicability of the Michaelis-Menten equation to both single-species and mixed-species marine phytoplankton populations is demonstrated. Inorganic carbon concentrations resulting in half-maximal fixation rates ranged 4.3-5.3 mg C/liter for mixed phytoplankton and 0.8-2.8 for axenic cultures of three algal species. Water samples were collected from the Port Hacking estuary, Australia, May-June 1975 and May 1976, and the plankton concentrated; the latter were composed mainly of diatoms and dinoflagellates. Log phase cultures of Amphidinium carterae, Chlorella vulgaris, and Phaeodactylum were grown in medium f. Algae were added to seawater of varying dissolved organic carbon (DIC) concentrations. The half-saturation constant values (K sub s) obtained imply not only that phytoplankton required 2.8 times the DIC concentration of the axenic algal cultures to reach the half-maximal carbon fixation rate, but the presence of the S sub o term (threshold concentration) indicates that phytoplankton required 0.88 mg C/liter as DIC before net carbon fixation could occur. It is suggested that the apparent distinguishing features of the phytoplankton may be due to the microheterotrophic components of such samples. (Lynch-Wisconsin)
W79-02224

SIMULATION MODEL OF CRYPTOMONAS OVATA POPULATION DYNAMICS IN SOUTHERN KOOTENAY LAKE, BRITISH COLUMBIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. E. Cloern.
Ecological Modelling, Vol. 4, No. 2-3, p 133-149, February, 1978. 12 fig, 27 ref. EPA R-800430.

Descriptors: *Kootenay Lake(B C Canada), *Simulation analysis, *Cryptomonas ovata, *Phytoplankton, *Advection, *Population dynamics, Model studies, British Columbia(Canada), Canada, Lakes, Mathematical models, Algae, Flagellates, Water circulation, Zooplankton, Anabaena, Grazing, Nutrients, Ammonium, Phosphates, Plant growth, Kinetics, Seasonal, Primary productivity, Photosynthesis.

A one-dimensional transient model is developed to simulate observed population dynamics of the small flagellate Cryptomonas ovata in southern Kottenay Lake (British Columbia, Canada) during a one-year period (June 1974-May 1975). The model considers advective displacement of the alga as water flows from the Kootenay River at the southern entrance to the lake and moves toward the sampling sites 11 km north of the river mouth. Specific growth rate is computed from an experimentally determined function of mean irradiance, water temperature, and nutrient concentrations (ammonium and phosphate) in the upper 10 m of the water column. Cell losses are assumed to result from zooplankton grazing and inhibition due to presence of the blue-green alga Anabaena. The model simulates well the timing and magnitude of all observed population changes except for a failure to time the autumn pulse accurately, and gives insight into the important mechanisms which regulate population density of C. ovata in this natural system. Modelling of individual algal species stressing their unique physiological characteristics is important in more precisely simulating overall phytoplankton population dynamics, species composition, and primary productivity. Output of individualized models will be valuable in explaining seasonal succession and secondary productivity (Lynch-Wisconsin)
W79-02225

WIND INDUCED DISPERSION AND ALGAL GROWTH IN SHALLOW LAKES,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering
For primary bibliographic entry see Field 5G.
W79-02226

A PATTERN ANALYSIS OF CLEAR LAKE PHYTOPLANKTON,
California Univ., Berkeley Lawrence Berkeley Lab.
J. C. Sandusky, and A. J. Horne.
Limnology and Oceanography, Vol. 23, No. 4, p 636-648, July 1978. 1 fig, 6 tab, 44 ref

Descriptors: *Phytoplankton, *Clear Lake(CA), *Spatial distribution, *Synoptic analysis, *Patchiness, *Statistical models, *Pattern analysis, Algae, California, Lakes, Measurement, Methodology, Analytical techniques, Model studies, Mathematical models, Statistical methods, Dominant organisms, Water chemistry.

Synoptic measurements of phytoplankton distribution in Clear Lake, California, and statistical methods were used to develop a systematic approach for interpreting synoptic surveys in the form of a distribution function. The resulting model was used to analyze water chemistry and phytoplankton data from Clear Lake; 43 sets of data representing 18 freshwater phytoplankton genera yielded reliable results using three fitted parameters per set. Local and regional variability were explicitly separated to avoid overestimating regional variability (patchiness) through counting individual cells of colonial or locally associated species as independent units. patchiness estimates showed significant interspecific variations related to nutrient variability, relative species dominance, and species sensitivity. Pooling cell frequencies for related species reduced patchiness estimates, implying that compaisons of spatial relations between biotic and abiotic parameters underestimate phytoplankton spatial organization when several species are present. In both marine and freshwater systems, phytoplankton patchiness is common and appears to be ecologically significant. Early studies were chiefly qualitative; recent quantitative studies can be categorized according to transect or synoptic sampling strategies. In a synoptic study water samples are collected from many sites over a large area; this method is useful where horizontal variation in more than one direction occurs, or where circulation, topographic, or inflow effects must be considered. (Lynch-Wisconsin)
W79-02227

THE UPTAKE, RETENTION, AND RELEASE OF AMMONIUM BY REEF CORALS,
California Univ., Los Angeles. Dept. of Biology.
L. Muscatine, and C. F. D'Elia.
Limnology and Oceanography, Vol. 23, No. 4, p 725-734, July 1978. 8 fig, 1 tab, 35 ref. NSF L.M. (PCM 74-91874).

Descriptors: *Ammonium, *Symbiosis, *Coral, *Zooxanthellae, *Nitrogen, *Essential nutrients, Nutrients, Pacific Ocean, Reefs, Michaelis-Menten equations, Diffusion, Oceans, Absorption, Light, Photoperiodism, Kinetics, Nutrient budgets, Darkness, Algae, Recycling, Cycling nutrients, Photosynthesis, Retention, Pocillopora, Tubastrea aurea, Porites lutea

A study of ammonium flux in Pacific reef corals (as part of construction of a nitrogen budget) showed that of three coral genera tested, only those symbiotic with zooxanthellae (chrysophyte algae) take up and retain ammonium. Uptake and retention were enhanced by light, and the normal daylight period was sufficient to sustain ammonium retention during the night for at least one coral (Pocillopora capitata). The effect of light was undoubtedly a function of zooxanthellar photosynthesis. Ammonium uptake kinetics for three species indicated that a two-process mechanism may be involved. With a correction for diffusion, uptake kinetics can be characterized by the Michaelis-Menten equation $V = (V_{max} S)/(K_s + S)$. The symbiotic corals seem generally well-adapted to

cope with a paucity of environmental nitrogen, retaining virtually all of the animal excretory ammonium and having the ability to scavenge ammonium from the environment. By preventing ammonium loss during night as well as day, and as a result of the translocation of combined nitrogen from algae to host, the coral-algal complex may recycle some combined nitrogen, which would help it to tolerate an environmental deficiency. Specimens were collected at Hawaii, Enewetak (northern Marshall Islands), Clarion Island (eastern Pacific), and the Great Barrier Reef (Australia). Species included Pocillopora damicornis, P. meandrina, P. capitata, Tubastrea aurea, and Porites lutea. (Lynch-Wisconsin)
W79-02228

RELATIONSHIPS AMONG SUBSTRATE, FLOW, AND BENTHIC MICROALGAL PIGMENT DENSITY IN THE MECHUMS RIVER, VIRGINIA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
P. Tett, C. Gallegos, M. G. Kelly, G. M. Hornberger, and B. J. Cosby.
Limnology and Oceanography, Vol. 23, No. 4, p 785-797, July 1978. 6 fig, 3 tab, 24 ref. NSF GB 32914.

Descriptors: *Mechums River(VA), *Pigments, *Substrates, *Streamflow, *Periphyton, *Biomass, Rivers, Virginia, Algae, Photosynthesis, Chlorophyll, Measurement, Estimating, Benthic flora, Microalgae, Spatial distribution, Current(Water), Patchiness, Sediments, Plant growth, Floods, Scour, Nutrients.

High streamflow due to unpredictable and heavy rainfall was the main factor controlling periphyton biomass in the Mechums River, a small river in the Virginia Piedmont; deterministic predictions of algal crop are therefore not possible in rivers of this type. Periphyton biomass was estimated on soft and hard substrates using measurements of photosynthetic pigments, which provided a faster method of quantifying the microalgae than direct estimation of algal numbers. The irregular distribution of periphyton was partially related to substrate distribution and is explained as a result of spatial variations in the current regime in the river. Results indicate a complex relationship between current velocity, prior flow regime, substrate type, and pigment density. Although nutrient levels probably control maximum biomass, the amount of variation in the chlorophyll density of samples from the same part of the river shows that nutrients do not play a major role in determining biomass at any particular point. The flow regime, which controls actual biomass, also determines the type of sediment. Likewise, although light and water temperature must influence periphyton growth rate, such effects are masked by the catastrophic effects of floods, which are more frequent in winter due to the reduced capacity of the soil to absorb participation. Effects of washout and scour become crucial during floods. (Lynch-Wisconsin)
W79-02229

THE DISTRIBUTION AND FORM OF PHOSPHORUS IN NORTH ATLANTIC OCEAN DEEP-SEA AND CONTINENTAL SLOPE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 5B.
W79-02230

THE COLONIZATION OF CABORA BASSA, MOCAMBIQUE, A NEW MAN-MADE LAKE, BY FLOATING AQUATIC MACROPHYTES,
Loxton, Hunting and Associates, Gaberone (Botswana).
For primary bibliographic entry see Field 4A.
W79-02231

SEASONAL CHANGES IN THE EPIPHYTE COMMUNITY OF NATURAL AND ARTIFICIAL MACROPHYTES IN LAKE MEMPHREMAGOG (QUE. AND VT.),
McGill Univ. (Montreal). Dept. of Biology.
A. Cattaneo, and J. Kalff.
Hydrobiologia, Vol. 60, No. 2, p 135-144, 1978. 9 fig, 2 tab, 28 ref.

Descriptors: *Seasonal, *Epiphytes, *Artificial substrates, *Potamogeton richardsonii, *Macrophytes, *Lake Memphremagog(VT Quebec), *Canada, Vermont, Quebec(Canada), Lakes, Substrates, Biological communities, Biomass, Chlorophyll, Species composition, Bays, Shallow water, Phytoplankton, Algae, Succession, Ecology, Calcium carbonate, Sessile algae, Species diversity, Leaves.

Seasonal changes in epiphyte biomass (measured as chlorophyll-a and cell volume) and species composition were compared on Potamogeton richardsonii and on a similar plastic plant in a shallow bay of Lake Memphremagog in Vermont and Quebec, Canada. Community development and diversity were both higher on the natural plant, apparently the result of summer accumulation of calcium carbonate observed only on the upper leaf surfaces of the natural plants. Precipitation of calcium carbonate by P. richarsonii constitutes its main effect on epiphyte development; there is no evidence for either direct inhibition or stimulation of epiphytes by the natural plants. Reduced epiphyte biomass on growing tips is attributable to an insufficient time for colonization rather than to inhibition by the macrophyte. Both the natural and artificial substrates exhibited two periods of high biomass during the June-September (1975) growing season: (1) in June, when the community was dominated by loosely attached species with a strong phytoplanktonic component (up to 37%), and (2) in September, when epiphytes were characterized by species tightly attached to the leaves. During both periods communities were better developed on the natural plants. Pairs of natural and artificial plants were planted at depths of 40-90 cm, and harvested randomly (generally weekly); 108 algal species were identified among the epiphytes: 90 species of Chrysophyta, 13 species of Chlorophyta, and five species of Cyanophyta. (Lynch-Wisconsin)
W79-02232

RELEASE OF DISSOLVED ORGANIC CARBON BY GRAZING ZOOPLANKTON,
Frankfurt Univ. (West Germany). Fachbereich Biologie.
W. Lampert.
Limnology and Oceanography, Vol. 24, No. 3, p 831-834, July 1978. 2 tab, 12 ref.

Descriptors: *Dissolved organic carbon, *Daphnia pulex, *Grazing, *Phytoplankton, *Zooplankton, Carbon, Organic matter, Particulate organic carbon, Cladocera, Algae, Carbon radioisotopes, Tracers, Lakes, Asterionella formosa, Stichococcus minutissimus, Stephanodiscus hantzschii, Nitzschia actinastroides, Cryptomonas ovata, Scenedesmus acutus, Secretion, Feces.

A conclusion that the cladoceran Daphnia pulex releases significant dissolved organic carbon (DOC) while feeding on six phytoplankton species found in freshwater lakes contradicts Wetzel's assumption that DOC excretion by zooplankton and higher animals is quantitatively negligible. The algal species were labelled with carbon-14 in the tests, designed to determine: (1) the amount of DOC released during ingestion, (2) DOC released by Daphnia secretion, (3) DOC released via leaching from Daphnia feses, and (4) the extent to which DOC release is dependent upon the algal food species. Up to 17% of the algal carbon was initially lost as DOC because of breakage of the diatoms Stephanodiscus hantzschii and Asterionella formosa and the relatively large flagellate Crytomonas ovata, while only 4% of carbon was lost from the other three species, which were swallowed whole. The latter species was the chlorophytes Scenedesmus acutus and Stichoccus minutissimus and the diatom Nitzschia actinastroides. Additional DOC was produced through Daphnia secretion and by leaching from feces. A total of 10-17% of the algal particulate organic carbon consumed by the daphnoids was transformed to DOC for all species except Stichoccus which was negligible. During periods when phytoplankton primary production is totally consumed by zooplankton, more than 10% of carbon fixed in photosynthesis is approximately added to the DOC pool through grazing zooplankton. (Lynch-Wisconsin)
W79-02234

NUTRIENT AND PARTICULATE FLUXES IN A SALT MARSH ECOSYSTEM: TIDAL EXCHANGES AND INPUTS BY PRECIPITATION AND GROUNDWATER,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
I. Valiela, J. M. Volkmann, D. Shafer, and E. J. Carpenter.
Limnology and Oceanography, Vol. 23, No. 4, p 798-812, July 1978. 9 fig, 7 tab, 40 ref. NSF GA-43008,GA-43009.

Descriptors: *Nutrient flux, *Particulates, *Salt marshes, *Great Sippewissett Marsh(MA), *Nitrogen, *Organic matter, Nutrient budgets, Limiting factors, Massachusetts, Nutrients, Ecosystems, Spartina alterniflora, Ammonium, Phosphates, Nitrates, Nitrites, Marsh plants, Groundwater, Rain, Carbon, Phosphorus, Import, Export, Precipitation(Atmospheric), Tidal effects, Tidal marshes.

Budgets of nitrogen species and particulate organic matter in Great Sippewissett Marsh, a tidal salt marsh at Falmouth, Massachusetts, by rain, flow of fresh groundwater, and the tidal exchanges were studied. Although it is generally believed that salt marshes export organic materials, the nature and extent of exchange between marshes and coastal waters has not been well understood. This study shows that during summer, uptake by marsh biota leads to net nutrient import, but there is a net annual export of ammonium, nitrate, nitrite, dissolved organic nitrogen (DON), particulate nitrogen (PN), particulate carbon (PC), and phosphate Increased ammonium export in August may be due to leaching from senescent marsh plants. Major nitrogen forms exported are ammonium, DON, and PN, and exports may contribute substantially to coastal water nutrient supplies. Groundwater, which brings in over 20 times more nutrients than rain, primarily imports nitrate-nitrogen and DON, while precipitation mainly provides DON, nitrate-nitrogen, and ammonium-nitrogen. Particulate materials in rain have a high cargon: nitrogen ration, and contribute little to enrichment of the nitrogen-limited salt marsh. About half the dissolved inorganic nitrogen brought in by groundwater is exported as PN, thus transforming nitrogen usable by primary producers into a form suitable for such consumers as shellfish. PC exported amounts to 40% of the net annual production of Spartina alterniflora, the dominant marsh plant. (Lynch-Wisconsin)
W79-02235

DEPENDENCE OF LIGHT-SATURATED RATES OF ALGAL PHOTOSYNTHESIS ON INTRACELLULAR CONCENTRATIONS OF PHOSPHORUS,
Minnesota Univ., Minneapolis. Dept. of Ecology and Behavorial Biology.
W. H. Senft.
Limnology and Oceanography, Vol. 23, No. 4, p 709-718, July 1978. 9 fig, 42 ref. ERDA E(11-1)-1820.

Descriptors: *Phosphorus, *Phytoplankton, *Photosynthesis, *Cell quota, *Light, *Plant growth, Chlorophyll, Intracellular nutrient concentration, Model studies, Mathematical models, Nutrients, Cyanophyta, Chlorophyta, Algae, Chlorella pyrenoidosa, Anabaena wisconsinese.

Specific photosynthetic rates of laboratory populations of a cyanophyte (Anabaena cf, wisconsinense) and a chlorophyte (Chlorella pyrenoidosa) at saturating irradiances were dependent on intracellular phosphorus(Q). A hyperbolic model of the form P sub opt=P sub opt=P sub opt-s (1-K sub Q/Q) was used to describe this relationship for

three measures of biomass: cell number, cell volume, and chlorophyll-a. The latter best dit the model. When chlorophyll-a was used as the measure of population size, both the maximal specific rate of photosynthesis (P sub opt-s) and the subsistence cell quota (K sub Q) for Anabaena were much large than for Chlorella. The dramatic differences in the responses of Anabaena and Chlorella to a fixed level of cellular phosphorus suggest that each species may have a characteristic P sub op-s and K sub Q calue, but whether this difference is characteristic of cyanophytes and chlorophytes in general is not known. Data presented here clearly indicate that the photosynthetic efficiency of a chlorophyll unit is not constant, but instead varies with the nutritional state of the algal population. The relationship between photosynthesis and intracellular nutrients is important because the dependence of growth rates on Q observed in laboratory populations probably reflects a more fundamental dependence of photosynthesis on the intracellular nutrients.
W79-02236

KINETICS OF ALGAL TRANSIENT PHOSPHATE UPTAKE AND THE CELL QUOTA CONCEPT,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
E. J. Brown, and R. F. Harris.
Limnology and Oceanography, Vol. 23, No. 1, p 35-40, January 1978. 4 fig, 1 tab, 21 ref. NSF AG-199, BMS76-00761193-69.

Descriptors: *Kinetics, *Absorption, *Phosphates, *Nutrients, *Cell quota, *Phytoplankton, Transient nutrient uptake, Algae, Selenastrum capricornutum, Nostoc, Bacteria, Orthophosphate, Inorganic compounds, Mathematical studies, Limiting factors, Plant growth, Microorganisms.

Dissolved inorganic orthophosphate (P sub i) uptake rates (v) were determined as a function of total cell phosphorous content (Q) in P sub i - perturbed axenic batch cultures of the green alga Selenastrum capricornutum and the blue-green bacterium Nostoc sp. Results showed an inverse relationship between v and Q for both organisms. The findings help relate the cell quota concept of nutrient-limited, steady-state microbial growth kinetics to nutrient uptake kinetics observed in perturbed batch cultures. Continuous-culture growth experiments have shown that one metabolic indicator of microbial growth-rate (mu) may be the cell quota (Q) -- the nutrient content of the organism. Cell quota has also been shown to control transient nutrient uptake rates, at least for growth-limiting nutrients. Low external limiting nutrients concentrations (S), resulting from aquatic microbial uptake, complicates interpretation of the kinetics of transient uptake, and steady-state growth, and has led to complex mathematical relationships among mu, S, and Q. Other factors are maximum growth rate constant (mu sub max), minimum cell nutrient content (k sub Q), maximum nutrient uptake rate constant (V), and half-saturation constants for growth (K sub mu) and uptake (K sub v). The cell quota concept is currently useful for relating microbial growth rate to changes in moderate to high levels of inorganic nutrients that are growth-rate limiting, but it is only an approximation. (Lynch-Wisconsin)
W79-02237

USE OF FLUORESCENCE MICROSCOPY FOR QUANTIFYING PHYTOPLANKTON, ESPECIALLY FILAMENTOUS BLUE-GREEN ALGAE,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
T. D. Brock.
Limnology and Oceanography, Vol. 23, No. 1, p 158-160, January 1978. 4 fig, 5 ref. NSF DEB77-03906 and ERD COO-2161-35.

Descriptors: *Phytoplankton, *Filamentous algae, *Fluorescence, *Microscopy, Measurement, *Methodology, Staining, Cyanophyta, Bacteria, Lake Mendota(WI), Wisconsin, Lakes, Eutrophication, Research equipment, Algae, Primuline stain, Fluorochromes, Filtration.

Epifluorescence after fluorochrome staining provides a simple and direct means of making phytoplankton on filters, visible, after which they can be quantified using various techniques. Water samples from Lake Mendota (Madison Wisconsin) were stained with fluorochrome primuline yellow (C.I. 49000) and filtered on black membrane filters. The phytoplankton were viewed under wet mount at high magnification (about 300-500x). for filamentous blue-green algae (for which the method is especially useful), Olson's procedure number five was used to make quantitative estimates of filament lengths, in turn used with measurements of diameter to calculate volume of the algae. Olson's procedure consists of: (1) fitting a measuring eyepiece with an ocular grid, (2) counting the number of crosses the filaments make with the grid's horizontal and vertical lines, (3) multiplying the number of crosses by pi/4 (0.786) to yield aggregate lengths of filaments per unit volume of water. Filament volume is then calculated using filament diameter. Samples were stirred prior to filtration to ensure homogeneous settling. The epifluorescence technique not only permits rapid counting with large volumes of water, but does not require an inverted microscope (though a fluorescence attachment is necessary). Bacteria can also be counted with use of a 100x objective. (Lynch-Wisconsin)
W79-02239

SOFT-SHORE MACROBENTHOS ALONG THE SOUTH-WEST COAST OF WALES,
University Coll. of Swansea (Wales). Dept. of Zoology.
R. G. Withers.
Estuarine and Coastal Marine Science, Vol. 5, No. 4, p 467-484, 1977. 1 fig, 2 tab, 51 ref, 3 append.

Descriptors: *Benthis fauna, *Spatial distribution, *Biomass, *Wales, *Beaches, *Intertidal areas, Crustaceans, Polychaetes, Arenicola marina, Cardium edule, Macrobenthos, Shores, Littoral, Milford Haven(United Kingdom), Gower Peninsula(Wales), Carmarthen Bay(Wales), United Kingdom, Distribution, Abundance.

Distribution, zonation and abundance of sand-dwelling fauna was investigated at 15 coastal beach sites between Milford Haven and Swansea Bay in southwestern Wales, United Kingdom. On the basis of geological characteristics and macrofaunal composition the area under study was divided into three regions: (1) Milford haven and the Angle Peninsula; 82) Carmarthen Bay; (3) South Gower and the Swansea Bay. At Milford Haven and the Angle Peninsula sediments consisted mainly of gravel overlain by a thin veneer of silty sand. Such places were colonized by small crustaceans and polychaetes. Where sand was deeper large populations of Arenicola marina and Cardium edule were found. In deep, medium and fine sands of the Carmarthen Bay area species of crustaceans and polychaetes were more varied. Molluscs and the echinoid Echinocardium cordatum were common. South Gower beaches contained well-sorted, medium or fine sand. Where beaches were well sheltered relatively large and diverse macrofauna was present, including bivalves and echinderms. The latter two were not present at the exposed beaches. Sediments at Swansea Bay ranged from clayey, black mud to coarse sand. Each sediment type supported its own characteristic macrofauna with the polychaete Lanice conchilega particularly abundant on the lower shore. Mean biomass levels for each of the regions ranged 0.25 - 13.7 g dry weight/sq m. Higher values were a result of abundance of one or two larger species. (Harris-Wisconsin)
W79-02240

BIOACCUMULATION POTENTIAL AND ACUTE TOXICITY OF SYNTHETIC FUELS EFFLUENTS IN FRESHWATER BIOTA: AZAARENES,
Oak Ridge National Lab., TN.
G. R. Southworth, J. J. Beauchamp, and P. K. Schmieder.
Environmental Science and Technology, Vol. 12, No. 9, p 1062-1066, September 1978. 3 fig, 1 tab, 25 ref. W-7405-eng-26.

Descriptors: *Azaarenes, *Toxicity, *Bioaccumulation, *Fuels, *Daphnia pulex, *Public health, *Carcinogens, *Human diseases, Isoquinoline, Acridine, Benz(a)acridine, Pollutants, Water pollution effects, Lethal limit, Effluents, Zooplankton, Kinetics, Equilibrium, Model studies, Mathematical studies, Mutagens.

Three polycyclic aromatic bases (isoquinoline, acridine, and benz(a)acridine), contained in coal-based synthetic liquid fuels, were concentrated from aqueous solutin by Daphnia pulex about 350-, 30-, and 2.5-fold, respectively. These substances containing a single basic nitrogen within two, three, four, or more aromatic ring systems (azaarenes) belong to a class of compounds which includes known mutagens and carcinogens. Data in this study established that bioaccumulation data were not collected at acutely toxic concentrations, and also indicated that toxicity of these compounds is determined more by differences in delivery of the various toxicants to the organisms than by variation of toxic action within the animal. All data indicate that releases of azaarenes to aquatic ecosystems must be minimized. Bioaccumulation kinetics were described as a first-order approach to equilibrium in a two-compartment model (water and Daphnia) using a two-stage technique to resolve uptake and elimination rates while accounting for decreasing aqueous concentrations. Equilibrium concentration factors increased dramatically with increasing molecular weights within the series of compounds and were also highly correlated with the calculated n-octanol/water partition coefficient. Acute toxicity exhibited the same relationship with changing molecular weight, with 24-hr LC50s of 0.4, 2.9, and 39.9 mg/liter for the three compounds. (Lynch-Wisconsin)
W79-02241

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING.
Washington Univ., Seattle. Dept. of Oceanography
J. R. Clayton, and N. F. Breitner.
Environmental Science and Technology, Vol 11, No 7, p 676-682, 1977. 5 fig, 8 tab, 43 ref.

Descriptors: *Polychlorinated biphenyls, *Zooplankton, *Puget Sound(WA), *Estuaries, *Bioaccumulation, Equilibrium partitioning, *Marine microorganisms, Water pollution sources, Path of pollutants, Estuarine environments, Dredging, Municipal wasters, Runoff, Bays, Gulfs, Food chains, Lipids, Trophic level

Zooplankton samples from Puget Sound, Washington were studied 1973-1975 to learn about factors that control bioaccumulation of chlorobiphenyls (CB) in lower trophic levels of nearshore ecosystems. Analysis of the data suggest that: (1) lipid-water concentration ratios for CB are constant over a range of spatial and temporal regimes; (2) the residue levels in ambient water and in zooplankton normalized to lipid is important in controlling the degree of accumulation, particularly when lipid constitutes more than 2% of zooplankton fresh weight; (3) lipid-water concentrations for CB are independent of changes in faunal composition; (4) the total reservoir of CB in the water is higher than that in the biota. Results of this study confirm that zooplankton are exposed to CB water concentrations for a period of time sufficiently long to establish equilibrium and that biota possess surface properties favoring establishment of rapid exchange between the internal lipid pools and the water medium. The type of bioaccumulation mechanism observed for CB are also relevant to the spatial and temporal distributions of other environmentally stable toxic organic chemicals in aquatic ecosystems and should be accounted for in environmental impact studies. (Harris-Wisconsin)
W79-02242

INTERSTITAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 2. NUTRIENT REGENERATION AND PHOSPHATE REMOVAL.

Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
C. S. Martens, R. A. Berner, and J. K. Rosenfeld.
Limnology and Oceanography, Vol. 23, No. 4, p 605-617, July 1978. 7 fig, 7 tab, 46 ref.

Descriptors: *Nutrient removal, *Phosphates, *Sediments, *Long Island Sound, *Interstices, *Water chemistry, Stoichiometry, Nutrients, Nutrient regeneration, Sulfates, Ammonia, Nitrogen, Phosphorus, Diffusion, Adsorption, Vivianite, Struvite, Chemical precipitation, Mineralization, Ions, Anaerobic conditions.

Nutrient regeneration chemistry in anoxic Long Island Sound sediments was examined through changes in the concentration of dissolved sulfate, ammonia, reactive phosphate, and other chemical species with depth in interstitial waters. In offshore sediments the ratio of mean changes in dissolved sulfate, dissolved ammonia, and dissolved reactive phosphate was -53:4.6:0.37; in shallow harbor sediment the ratio was -53:19:3.3 and changes in ammonia and reactive phosphate ratios were half the offshore ratio. These apparent shoreward changes reflect more rapid deposition and therefore either less preferential stripping of phosphorus and nitrogen from organic material before burial in shallow water harbor sediments, or selective stripping in the heavily bioturbated upper sediment layers offshore, or both. Effects of differential diffusion and adsorption of ammonia and phosphorus are considered. Phosphate concentration maxima in ammonia-and phosphate-rich shallow harbor sediments yield evidence for possible equilibrium with respect to vivianite and struvite. Phosphate removal at depth at two of the coring sites was probably caused by authigenic mineral formation. The three sites in Long Island Sound were chosen to represent sedimentary environments with a range of dissolved sulfate distributions; water depths (mean low tide) were about 7.0, 2.0, and 1.5 m, at the stations. (See also W77-06900) (Lynch-Wisconsin)
W79-02243

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA, WASHINGTON, IX. FACTORS CONTROLLING THE SEASONAL CYCLE OF NITRATE IN THE SURF AT COPALIS BEACH (1971 THROUGH 1975),
Washington Univ., Seattle. Dept. of Oceanography.
J. Lewin.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 173-183, August 1978. 8 fig, 2 tab, 15 ref.

Descriptors: *Diatoms, *Copalis Beach(WA), *Surf, *Eutrophication, *Nitrates, *Limiting factors, Nutrients, Cycling nutrients, Washington, Olympic Peninsula(WA), Surf diatoms, Beaches, Algae, Phytoplankton, Upwelling, Ammonia, Thalassiosira pacifica, Asterionella socialis, Chaetoceros armatum, Nearshore zone, Winds, Discharge(Water), Rivers, Salinity, Seasonal, Pacific Ocean, Oceans, Surface waters, Nitrogen cycle.

Investigation of the seasonal nitrate cycle at Copalis Beach, Olympic Peninsula, Washington, in 1971-75 showed that: (1) annual nitrate depletion in April in upper waters beyond the breaker zone and in the surf zone is due to spring phytoplankton blooms; (2) reintroduction of nitrate into the surf region mid-April to mid-October depends on encroachment of nitrate-rich upwelled oceanic deep water; (3) upwelling can be masked by freshwater stream and river discharge; (4) seasonal species abundance cycles were repeated annually and did not depend on varying nitrate concentrations; and (5) ammonia is an important alternate nitrogen source for surf diatoms, particularly during summer. Water samples were collected from the surf zone and from beyond the breakers triweekly for 24 hrs (sampling every three hrs), and salinity and temperature were measured. 1971 was characterized by greatly reduced coastal upwelling, and 1973 by record low rates of freshwater discharge from coastal rivers. During 1971 nitrate in the surf remained depleted over an extended period (six months), and in 1973 nitrate concentrations in summer surf samples were the highest of the study. In 1974 Thalassiosira pacifica was responsible for almost all the nitrate depletion beyond the breakers. During all summers, cell concentrations of both surf diatom species were reduced, with Asterionella socialis disappearing completely, and Chaetoceros armatum exhibiting physiological stress. (Lynch-Wisconsin)
W79-02244

A BUDGET OF NITROGEN RECYCLING IN NORTH SEA SEDIMENTS OFF THE BELGIAN COAST,
Brussels Univ. (Belgium). Lab. d'Environnement.
G. Billen.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 127-146, August 1978. 11 fig, 8 tab, 45 ref.

Descriptors: *North Sea, *Sediments, *Nutrient budgets, *Nitrogen cycle, *Cycling nutrients, *Methodology, Measurement, Belgium, Coasts, Offshore zone, Nearshore zone, Mathematical models, Model studies, Ammonium, Nitrates, Nutrients, Benthic fauna, Benthos, Nitrogen fixing bacteria, Denitrification, Nitrification, Recycling, Interstices, Seas, Sediment-water interfaces, Simulation analysis.

A new method of determining nutrient flux across the sediment-water interface was used to evaluate nitrogen recycling in sediments of the Southern Bight of the North Sea off the Belgium coast. The method is a simplified diagenetic model which uses: (1) vertical profiles of ammonium and nitrate concentrations measured in interstitial water of the sediments, plus (2) direct measurements of ammonification, nitrification, and denitrification rates in the same sediment samples. The model, which simulates the concentration profile in the interstitial water, permits evaluation of ammonium and nitrate fluxes across the sediment-water interface. Such fluxes are important in the whole nitrogen cycle of the ecosystem. Fluxes of ammonium and nitrate from sediments to the water column account for an estimated 62-105% of primary producer requirements in the North Sea coastal zone, and 30-52% in the offshore zone, indicating an important part of nutrient recycling occurs in the benthic phase rather than in the water column, particularly in the coastal zone. Cores for this study were collected 1974-76 in PVC core-liner tubes 30 cm long and seven cm in diameter. Only this manual method left the sediment surface undisturbed. Existing methods for determining nutrient flux have not always been satisfactory, and the importance of recycling of biogenic elements in sediments has often been underestimated. (Lynch-Wisconsin)
W79-02245

SPECIFIC BLUE-GREEN ALGAL CAROTENOIDS IN SEDIMENTS OF ESTHWAITE WATER,
Washington Univ., Seattle. Dept. of Zoology.
M. Griffiths.
Limnology and Oceanography, Vol 23, No. 4, p 777-784, 1978. 3 fig, 18 ref.

Descriptors: *Esthwaite Water(United Kingdom), *Cyanophyta, *Carotenoids, *Myxoxanthophyll, *Oscillaxanthin, *Pigments, *Eutrophication, Lakes, Bioindicators, England, Algae, Sediments, Cores, Oscillatoria, Sedimentation, Nutrients, Water pollution effects, Dating, Age, Fertilizers, Tourism, Water pollution sources.

Comparison of sediment cores and cyanophyte records in 1948-75 for moderately eutrophic Esthwaite Water in the English Lake District permitted correlation of algae in the lake with their pigments in recent sediments. Core profiles of such pigments can indicate appearance of cyanophytes in a lake, and can therefore indirectly predict the onset of eutrophication. The pigment oscillaxanthin is found primarily in some species of Oscillatoria. Myxoxanthophyll is generally considered characteristic of cyanophytes. Two cores five cm in diameter and one m long were taken in the lake's deepest part (13.5-15.0 m deep). Myxoxanthophyll profiles in the two cores showed maxima at 6-7 cm and 14-16 cm and low values in the top five cm and below 17-19 cm. Oscillaxanthin profiles followed a similar pattern, but without the pronounced maxima. Correlation of maximal algal counts in lake water with depths of myxoxanthophyll sediment maxima yielded an annual sedimentation rate of the top 15 cm of 0.6 cm/yr, which agrees well with other methods. Sediment dating with 210Pb gave 1885 for 40 cm. Core profiles suggest that cyanophyte populations were negligible before 1885, increased slowly 1885-1945, and then increased steeply from 1945 to the known maxima of 1948-49 which coincides with tourist influx and increased fertilizer use. Low cyanophyte levels in the last five years may indicate that eutrophication has advanced to where groups other than cyanophytes have become dominant. (Lynch-Wisconsin)
W79-02246

AN EVALUATION OF PHOSPHORUS-CHLOROPHYLL-PHYTOPLANKTON RELATIONSHIPS OF LAKES,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
K. H. Nicholls, and P. J. Dillon.
Internationale Revue der Gesamten Hydrobiologie, Vol 63, No 2, 1978. p 141-154. 6 fig, 3 tab, 54 ref.

Descriptors: *Lakes *Phytoplankton, *Phosphorus, *Chlorophyll, *Trophic level, *Eutrophication, *Estimating equations, *Analytical techniques, *Measurement, Nutrients, Algae, Methodology, Model studies, Mathematical studies, *Reviews, Forecasting, Seasonal, Stratification, Solar radiation, Cell volume, Biomass, Estimating, Carbon, Calories.

Comparison of several phosphorus-chlorophyll-phytoplankton relationships in recent literature reveals considerable variation, only some of which can be attributed to variation in sampling and analytical techniques. Even under consistent sampling and analysis, significant inherent variability in phosphorus-chlorophyll relationships has been documented; cellular algal chlorophyll content ranges over two orders of magnitude (0.1-9.7% of fresh weight). It is concluded that direct microscopic determination is the best estimation for phytoplankton biomass; for studies requiring only an average biomass value for lake trophic state categorization, analysis of a single combined sample is suggested. Carbon and caloric content relate much better than pigment content to algal biomass, but measurements of carbon and calories in lake water usually includes detritus and animals. In a group of interconnected Ontario lakes it is shown that relationships between average total phosphorus and phytoplankton biomass are much better defined if summer average cell volume is used instead of summer average chlorophyll-a. Chlorophyll content of algal cells seems primarily controlled by four factors: (1) average daily incident radiation intensity, (2) species composition, (3) nutrient availability (especially nitrogen), and (4) innate physiology. Total phosphorus may not be the best universal measure of available phosphorus, but refinement would involve rather sophisticated bioassay techniques. (Lynch-Wisconsin)
W79-02247

THE UPTAKE OF DISSOLVED ORGANIC MATTER BY A SMALL SPRING STREAM,
Waterloo Univ. (Ontario). Dept. of Biology.
D. L. Lush, and H. B. N. Hynes.
Hydrobiologia, Vol. 60, No. 3, September 1978, p 271-275. 3 fig, 1 tab, 9 ref.

Descriptors: *Streams, *Organic matter, *Leaves, *Leachate, *Dissolved solids, *Self-purification, *Absorption, *Adsorption, Spring waters, Ouse River(Ontario Canada), Canada, Maple trees, White cedar trees, Acer saccarum, Thuja occidentalis, Tracers, Sodium chloride.

Leachates of dead leaves from sugar maple (Acer saccharum) and eastern white cedar (Thuja occidentalis) were added to a tiny spring-fed headwater of the Ouse River, Ontario, Canada; sampling

at three weirs showed organic matter was removed from solution at remarkedly high rates (0.5-1.1 g/sq m/hr). Data suggest chemical uptake (possibly by adsorption) was responsible for most of the initial removal, with absorption occurring secondarily. The stream rises from a spring boil at the edge of a small pool and flows through a small channel over a substratum of cobbles, fine sand, clay, organic debris, and old logs and branches. The hard water (200 mg/l total hardness) had a pH of 7.8. Background sodium was one mg/l and dissolved organic carbon two mg/l. Three small weirs were installed at 10-11 m intervals to permit sampling and measurement of flow rate. About 12 g of auto-claved leaf leachate with a sodium chloride tracer were added to the pool above the weir one and samples were collected at each weir every 10-15 min for at least 90 min. While the sodium was persistent, 36-86% of the organic matter was lost during the 30 min trip to weir no. three in the first three experiments (October-December 1972). In the fourth experiment, conducted in April 1973 after spring runoff, there was not measurable reduction in organic matter, but leachate had been held for five days at 10C before use and had lost most of its dissolved material. (Lynch-Wisconsin)
W79-02248

MAXIMUM DEPTH INHABITED BY AQUATIC VASCULAR PLANTS,
Rensselaer Polytechnic Inst. Troy, NY. Dept. of Biology.
R B Sheldon, and C W Boylen.
The American Midland Naturalist, Vol 97, No 1, January 1977, p 248-254, 2 fig, 1 tab, 20 ref.

Descriptors: *Depth, *Lake George(NY), *Rooted aquatic plants, *Light penetration, *Submerged plants, *Transparency, *Oligotrophy, Secchi disc, Macrophytes, Algae, New York, Lakes, Turbidity, Light intensity, Potamogeton, Myriophyllum, Isoetes, Elodea canadensis, Elatine minima, Eriocaulon septangulare, Najas flexilis, Utricularia resupinata, Vallisneria americana, Eutrophication, Nutrients.

Maximum and preferred depth distributions of 28 submerged rooted vascular aquatic plants were studied by divers in oligotrophic Lake George, New York; maximum depth for several species is greater than previously reported. Greatest depth for any one species is 12 m for Elodea canadensis, followed by 10 m for Potamogeton robbinsii, and nine m for P. pusillus, Isoetes macrospora, and Najas flexilis. In most freshwater ecosystems vascular plants are reported limited to less than five m depth, and the previous maximum reported was 10 m in a few lakes. Lake George has exceptionally high water clarity but nutrients are sufficient to support relatively abundant vascular plant growth without encouraging phytoplakton productivity to the extent of reducing availability of light at 10-12 m. Observations were made June 1973- August 1975 at random sites on the periphery of the lake, which is 51 km long by about 2.3 km wide, with a 60 m maximum depth. Water clairty is sufficient to allow 10% of surface light intensity during midsummer to penetrate to 12 m. Secchi disc readings are commonly 6 - 7 m with values as high as 13.5 m recorded. The number of submergent species drops linearly from 38 at one m to one at 12 m. Although it has been stated that hydrophytes may colonize substrates to a depth receiving only 1-4% of surface light intensity, in Lake George depths receiving more than 1% exceed 18 m, while the limit of plant growth is 15 m (the microalga Nitella flexilis). (Lynch-Wisconsin)
W79-02249

RECENT CHANGES IN PLANKTON COMMUNITIES AND PRESENT TROPHIC STATE OF LAKE STEINSFJORD,
Oslo Univ. (Norway). Dept. of Limnology.
O. K. Skogheim, and S. Rogenrud.
Archiv fur Hydrobiologie, Vol 83, No. 2, p 179-199, June 1978. 12 fig, 4 tab, 32 ref.

Descriptors: *Lake Steinsfjord(Norway), Limnology, *Eutrophication, *Phytoplankton, *Zooplankton, *Trophic level, *Food chains, Mesotrophy, Norway, Lakes, Hydrography, Metabolism, Energy transfer, Primary productivity, Dissolved oxygen, Bioindicators, Food habits, Grazing.

Comparisons of a 1972-73 limnological investigation of Lake Steinsfjord in southeastern Norway with data from earlier studies shows both quantitative and qualitative changes in the planktonic community which indicate increasing eutrophication, though the lake is classified as mesotrophic. Human influence is probably responsible for this enrichment. Despite as years of increased plankton biomass, anaerobic conditions have not developed in the hypolimnion due primarily to highly dynamic energy metabolism in the epilimnion and the general hydrographic features of the lake (including high hypolimnetic temperature and early autumn turnover). In late summer and early autumn 60-80% of primary production is assimilated by nannoplankton-feeding zooplankton. The appearance and increase of several phytoplankton species indicate increasing eutrophication: Oscillatoria rubescens, Aphanizomenon flos-aquae, Asterionella formosa, Tabellaria fenestrata, and Fragilaria crotonensis. The quantative increase in phytoplankton biomass has a correspondingly increased zooplankton, especially in herbivorous species Daphnia galeata and Eudiaptomus gracilis. The appearance of Mesocyclops leuckarti, M. oithonoides, and Daphnia cristata may indicate eutrophication. This paper focuses on composition and biomass of phytoplankton and zooplankton and interrelationships between the two trophic levels (Lynch-Wisconsin)
W79-02250

A COMPUTER SIMULATION OF PHOSPHATE AND NITROGEN TRANSPORT BY WATER RUNOFF,
Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
For primary bibliographic entry see Field 5B
W79-02251

PARTICULATE AND DISSOLVED ORGANIC MATTER IN A SMALL PARTLY FORESTED ONTARIO STREAM,
Waterloo Univ., (Ontario). Dept. of Biology.
D. L. Lush, and H. B. N. Hynes.
Hydrobiologia, Vol. 60, No. 2, p 177-185, 1978. 8 fig, 19 ref.

Descriptors: *Streams, *Particles, *Organic matter, *Dissolved solids, *Particle size, *Laurel Creek(Ontario), Ontario(Canada), Canada, Carbon, Forest watersheds, Rainfall, Proteins, Carbohydrates, Insects, Invertebrates, Secondary productivity, Chlorophyll, Pigments, Biological communities.

Particulate organic matter (POM) and dissolved organic matter (DOM) fluctuated considerably during a study in the headwaters of Laurel Stream, a small, partially forested, relatively undisturbed stream in Ontario, Canada; rainfall had a strong influence on inputs of organic matter. Five stations were sampled weekly from April thaw until freeze-over in late November 1971. Biota of most streams are greatly dependent on allochthonous organic matter, which fluctuates between DOM (<0.5 micrometer) and POM states. Coarse particles are readily eaten by invertebrates and fine particles are eaten by such specialists as blackfly larvae and net-spinning caddisworms. DOM apparently is not directly eaten, but is rapidly removed from the stream system and presumably becomes available as food. In this study size distribution of POM varied irregularly. Rainfall tended to increase their total quantity as well as their dissolved organic carbon (DOC) concentration; other local factors also affected particle supply. High POM concentration was associated with high amounts of plant pigments, carbohydrate, and protein. Similarly, rain-caused increases in DOC were accompanied by increases in dissolved carbohydrate and protein. Dissolved material behaved more predictably, with a large part rapidly removed from solution. These findings suggest a series of mechanisms by which a woodland stream may trap woodland-produced energy and cycle it through the aquatic system. (Lynch-Wisconsin)
W79-02252

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02256

CHANGES IN UNDERSTORY VEGETATION IN CYPRESS DOMES BROUGHT ABOUT BY FIRE AND ADDITION OF SEWAGE,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
K. C. Ewel.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 171-189, 1976. 3 fig, 6 tab.

Descriptors: *Swamps, *Aquatic plants, *Burning, *Water pollution effects, Succession, Wetlands, Florida, Marsh plants, Distribution patterns, Waste water disposal.

The effects of application of groundwater and sewage on ecological relationships in burned and unburned cypress domes was monitored over a two-year period since the initial treatments. There were rapid changes in dominace and invader species of understory vegetation for the burned, sewage dome than in any of the others. The duckweed layer is also thicker. The presence of sewage does not seem to have had an overriding influence in determining vegetation; however, the two sewage domes are less similar to one another in species composition than are the two burned domes. The similarity index for the species composition shortly after sewage introduction and one year later was 78 (possible maximum of 86) for the unburned dome, but only 62 for the burned dome, suggesting greater constancy for the flora in the second sewage dome in response to the stress of sewage. This suggests that the presence of nutrient vegetation at the time of sewage introduction has damped the kinds of changes in the unburned dome. (See also W79-02256) (Steiner-Mass)
W79-02263

UPTAKE AND DISTRIBUTION OF PHOSPHORUS IN THE UNDERSTORY OF CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands
G. S Deghi
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 193-196, 1976.

Descriptors: *Swamps, *Marsh plants, *Phosphorus, Wetlands, Florida, Nutrients, Sediments

From field studies using radioacitive phosphorus, values for plant uptake of phosphorus and incorportation of phosphorus into the sediments and detritus was determined. Ion uptake in duckweed and Utricularia is ten to one hundred times greater than in the two emergent species, Woodwardia and Saururus. Radioactivity of rinsed sediment samples and filtrates was similar to background counts. The upper 10 cm of the organic sediments has few exchange sites and the P32 becoming incorportated into the sediment is absorbed at a greater depth. (See also w79-02256) Steiner-Mass)
W79-02264

LITTERFALL AND LITTER DECOMPOSITION IN FOUR CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands
For primary bibliographic entry see Field 2I
W79-02265

AIR EMISSIONS FROM CYPRESS SWAMPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science; and Florida Univ., Gainesville. Center for Wetlands.
A. A. Linero.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 269-294, 1976. 2 fig, 4 tab, 7 ref, 3 append.

Descriptors: *Swamps, *Water pollution effects, *Gases, Wetlands, Florida, Waste water disposal, Methane.

This study was undertaken to determine the types and quantities of gases being emitted from a sewage-fed cypress dome and to compare these with emissions taken from a control dome. Data from the sewage-fed dome indicates that reactions occur characteristic of the anaerobic digestion of organic matter by bacteria which exist in the water and/or sediments. These reactions account for the presence of carbon dioxide, methane, and hydrogen sulfide. While no gas was evolved and collected from the natural dome, it was concluded that similar processes do occur in the sediments. The method of floating collectors is useful in directly determining emissions of soluble gases such as methane. The method is also useful in determining equilibrium vapor pressures of soluble components such as sulfur dioxide and carbon dioxide. From equilibrium vapor pressure data emission factors can be calculated from transport phenomena calculations. The method is not useful for determining nitrogen and oxygen emissions since the natural tendency is the equilibrium between partial pressures in the atmosphere, the vials, and the liquid phase. (See also W79-02256) (Steiner-Mass)
W79-02266

THE RESPONSE OF BENTHIC INVERTEBRATE POPULATIONS TO SEWAGE ADDITION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
R. S. Brightman, and J. L. Fox.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 295-308, 1976. 2 fig, 6 tab, 1 ref.

Descriptors: *Swamps, *Water pollution effects, *Invertebrates, *Distribution patterns, *Bioindicators, Wetlands, Florida, Waste water disposal, Aquatic animals, Ecological distribution, Water analysis, Water quality.

A decrease in invertebrate diversity observed in cypress domes used to dispose of secondarily treated sewage can be interpreted as indicating an increase in stress. The major form of stress was increased organic material causing oxygen depletion. As organisms died off, the species composition shifted toward those organisms able to tolerate the low oxygen levels. These tolerant organisms became more abundant because of the elimination of their competitors and predators. This caused an invertebrate assemblage dominated by a few species containing many individuals, by definition, low diversity. More meaningful than a single idea was the spatial variation in the sewage domes. The characteristics of the sewage dome centers were those of heavily polluted waters. These characteristics became increasingly indicative of cleaner water as distance from the sewage dome centers increased. The cypress domes, acting as natural treatment systems, improved the water quality as it moved from the center. The response of the invertebrates to the sewage effluent may be useful in determining when it is time to stop loading a specific dome in a system of alternative sites. Invertebrates may also be useful in determining proper loading rates, avoiding the alteration of sites altogether. (See also W79-02256) (Steiner-Mass)
W79-02267

COLIFORM MONITORING OF WATERS ASSOCIATED WITH THE CYPRESS DOME PROJECT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. Allinson, and J. Fox.
In: Third Annual Report on Cypess Wetlands, Florida University, Center for Wetlands, Gainesville, p 309-320, 1976. 3 fig, 4 tab.

Descriptors: *Swamps, *Water pollution effects, Wetlands, Florida, Waste water disposal, Bacteria, Sewage.

Cypress domes appear to be effective in preventing fecal coliforms from percolating through the soil to the groundwater. Overflow of the cypress domes used for dumping secondarily treated sewage appears to be the major cause of infilration of coliforms into shallow groundwater. Coliform numbers are highest near the inflow of the sewage effluent and decrease with distance toward the edges. (See also W79-02256)(Steiner-Mass)
W79-02268

WATER QUALITY OF CYPRESS DOMES: ROUTINE SAMPLING PROGRAM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Scientific; and Florida Univ., Gainesville. Center for Wetlands.
F. E. Dierberg, and P. L. Brezonik.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 337-371, 1976. 12 fig, 5 tab, 5 ref.

Descriptors: *Swamps, *Water pollution effcts, *Biochemical oxygen demand, Wetlands, Florida, Waste water disposa, Sewage, Dissolved oxygen, Nutrients.

Surface water quality in cypress domes receiving secondarily treated sewage consistently exceeded the level for Biochemical Oxygen Demand (BOD), total P, and total N recommended in the effluent waters from tertiary sewage treatment plants by current State of Florida Standards. The capability of the cypress domes to reduce and/or remove nutrients and oxidizable organics in the sewage therefore does not compare to that of an advanced sewage treatment plant. At the present sewage application rates of one inch per week, surface water quality parameters affected adversely include dissolved oxygen, BOD, sulfide, and nutrients, the levels of which support large standing crops of aquatic angiosperms. The soft, acid water normally found in cypress domes has been altered to a neutral, moderately-hard condition. There are significant seasonal and spatial variations in the levels of chemical parameters. (See also W79-02256)(Steiner-Mass)
W79-02269

DENITRIFICATION AND SURFACE RUNOFF IN THE EXPERIMENTAL DOMES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Centre for Wetlands.
F. E. Dierborg, and P. Brezonik.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 383-404, 1976. 2 fig, 6 tab, 2 ref.

Descriptors: *Swamps, *Water pollution effects, *Nutrients, *Wetlands, Florida, Waste water disposal, Sewage, Phosphorus, Nitrogen.

Denitrification occurs to only a limited extent in cypress domes receiving secondarily treated sewage. The most liberal calculation suggests a maximum of only 11% of the total N pumped in could be lost via denitrification. Nutrients entering the domes via surface runoff are of minor importance compared to the nutrient loading from the sewage. Annual total N and P loading from surface runoff contributed only 3-6% and 1-2%, respectively, compared to the sewage. Maximum concentrations for nitrogen species were found to occur at the initial onset of surface runoff and to decrease with time. (See also W79-02256) (Steiner-Mass)
W79-02270

RATES OF GROWTH AND NUTRIENT CONCENTRATIONS OF TREES IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
D. M. Post, P. A. Straub, and W. Smith.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 422-446, 1976. 22 tab.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, *Nutrients, Wetlands, Florida, Waste water disposal, Sewage, Trees, Growth rates, Phosphorus, Nitrogen.

Concentrations of nitrogen and phosphorus have not increased appreciably in trees growing in domes receiving secondarily treated sewage. Phosphorus did show more of an increase than did nitrogen, however. Core samples for Nyssa biflora and Pinus elliotti indicate that these species may be more sensitive to phosphorus increases than the cypress, Taxodium distichum. Phosphorus levels in the cores from cypress trees in the sewage domes are twice as high as the levels in cores on the natural control dome. Domes receiving sewage or having been burnt previously had significantly greater tree growth than did a control dome. (See also W79-02256)(Steiner-Mass)
W79-02271

GROWTH RATES OF SEEDLINGS PLANTED IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
G. S. Deghi.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 453-469, 1976. 9 fig, 1 append.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, Wetlands, Florida, Waste water disposa, Sewage, Trees, Growth rates, Vegetation establishment.

Three species of seedlings, tupelo, bald cypress, and pond cypress, responded differently to the addition of secondarily treated sewage effluents. Input of sewage seems to be detrimental to the growth of tupelo and young bald cypress seedlings. This is possibly related to stresses caused by an anaerobic environment. Older bald cypress seedlings (greater than six months) in the sewage dome exhibited similar growth patterns as control dome seedlings. The increased nutrient input in the sewage domes seems to stimulate the long-term growth of pond cypress seedlings. (See also W79-02256)(Steiner-Mass)
W79-02272

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON SURROUNDING SOIL MOISTURE AND NUTRIENT CONTENT AND ON GROWTH OF PINE TREES (SUMMARY OF MS THESIS),
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
P. E. Okorie.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 470-503, 1976. 7 fig, 2 tab, 58 ref.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, *Soil moisture, Wetlands, Florida, Waste water disposal, Sewage, Trees, Growth rates, Nutrients, Hydrogen ion concentration.

The surface soil moisture content was highest near the pond and decreased with distance from the pond margins. At a depth of 30.5 cm, the moisture content of the soil at the sewage dome was significantly higher than the control at a distance of 20 m from the pond edge. The pH of the soil at a depth of 80 to 100 cm was higher for the control by a range of 0.35 at 20 m to 1.3 at 5 m from the edge of the pond, indicating the modifying effect the treated pond could have on the pH of the surrounding soils. Results of foliar analysis showed no profound

effect on nutrients levels due to effluent application. Nevertheless, amounts of N, K, and Mg were higher at the flooded edge of the pond than farther out in the drier areas. The fact that trees near the pond with their roots in the waterlogged soils were growing at almost the same rate as those on drier lands farther from the edge indicated that additional nutrients from the effluent raised the nutrient levels of the soil around the roots thus enabling them to withstand effectively the deleterious effects of waterlogging and high pH. (See also W79-02256)(Steiner-Mass)
W79-02273

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON GROWTH OF SURROUNDING PINE SEEDLINGS AND TREES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
P. E. Okorie.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 504-509, 1976. 3 fig, 1 ref.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, *Pine trees, Wetlands, Florida, Waste water disposal, Sewage, Trees, Growth rates.

In both cypress domes receiving secondarily treated wastes and control domes, growth response still appeared to be related to varying drainage conditions of the soil. The seedlings near the treated dome had almost the same height increments as those farther away. Very likely, the nutrients in the effluent had started to move out from the dome This coupled with the modification of the soil pH could be responsible for narrowing the margin of difference between height increments of the seedlings near the pond and those far away from it. Height increments were higher for trees near the dome than those farther away. Possibly, the trees near the dome benefited from the nutrients and water in the effluent, particularly during a dry season. (See also W79-02256)(Steiner-Mass)
W79-02274

SEDIMENTATION RATES: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Soil Science.
J. E. Struble, and D. A. Graetz.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 510-515, 1976. 5 fig.

Descriptors: *Swamps, *Water pollution effects, *Sedimentation rates, Wetlands, Florida, Waste water disposal, Sewage, Detritus.

Field data were collected on the rate of sedimentation in two cypress domes receiving sewage effluent and one receiving groundwater. For each dome the sedimentation rate is greater for the traps that are closer to the center. This may be due to the fact that the discharge pipes are near the center in each of the domes. The traps that are within 10 meters of the center may be picking up material that gets resuspended during effluent or water discharge to the dome. The three domes show a difference in sedimentation rates. In sewage dome 1, the average rates range from 5.07 to 18.85 g/sq m/day as compared to 5.23 to 10.77 g/sq m/day for sewage dome 2, and 6.14 to 8.3 g/sq m/day for the groundwater dome. In the sewage domes the majority of the material collected is very flocculant; they also have duckweed which settled to the bottom. The material in the groundwater dome consists more of litter that has fallen. (See also W79-02256) (Steiner-Mass)
W79-02275

NITROGEN TRANSFORMATIONS IN WATER AND SEDIMENTS OF CYPRESS DOMES WITH AND WITHOUT ADDED SEWAGE EFFLUENT,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W79-02276

DISTRIBUTION OF CHLOROPHYLL IN CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02278

THE EFFECTS OF PERTURBATION ON CYPRESS DOME ANIMAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
W. Jetter, and L. D. Harris.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 577-653, 1976. 38 fig, 5 tab, 17 ref, 3 append.

Descriptors: *Swamps, *Water pollution effects, *Aquatic animals, *Aquatic habitats, Wetlands, Florida, Waste water disposal, Sewage, Aquatic insects, Diptera, Frogs, Amphibians, Wildlife, Birds, Water birds, Mammals, Freshwater fish, Invertebrates, Small animals(Mammals).

Important structural and functional changes occur in the consumer communities of cypress domes receiving treated sewage. Shifts in the type and amounts of food available have caused populations of key groups of animals to be altered. With the formation of a floating mat of organic material on the pond surface, there is a massive shift from aquatic detritivores which complete their life cycle within and upon the organic mat. This attracts numerous frogs to the site but tadpole development is prevented because of the anaerobic conditions. The frog population consists totally of migrants from neighboring, untreated domes. Many fish and aquatic invertebrate species are also eliminated because of the anaerobic conditions. Birds feeding on these aquatic organisms decrease in numbers while species feeding on the organic mat detritivores increase. In addition to shifts in total numbers and biomass, marked changes occurred in the spatial distribution of the birds within the sewage domes. Sewage treatment probably had a positive effect on small mammal populations because of more vigorous and nutritious vegetation growth. (See also W79-02256) (Steiner-Mass)
W79-02279

COMPARISON OF FALL BIRDS PRESENT IN A NATURAL CYPRESS DOME, AND THE ADJACENT PINE PLANTATION,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
A. Ramsay
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 654-670, 1976. 5 tab, 21 ref.

Descriptors: *Swamps, *Water pollution effects, *Song birds, Wetlands, Florida, Waste water disposal, Birds

The number of species detected varied from a low of eight in the natural dome center to a high of fifteen in the sewage dome ecotone. The mean species number observed in the sewage dome ecotone was significantly different from the other sampled areas except for the pine plantation. The value obtained from the plantation was significantly different only from the natural dome ecotone. Mean diversity shows the same relationship: no significant differences were found in equitability (evenness) values between study areas; therefore, differences in diversity can be attributed to differences in species richness. The highest avian diversity was found in the sewage dome ecotone with the pine plantation second. The natural cypress dome ecotone showed the lowest diversity. Most birds observed were common residents or common winter visitors in this area. The phoebe, white-eyed vireo, and swamp sparrow were seen in association with the sewage dome, while robins were detected in conjunction with the natural dome and plantation. Both study domes showed a similarity index of approximately 65% when compared to their respective ecotones. The two dome centers showed a similarity of 44%, while the value between ecotones was 48%. (See also W79-02256) (Steiner-Mass)
W79-02280

CYPRESS GROWTH RESPONSE IN A SEWAGE-ENRICHED POND CYPRESS ECOSYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
M. S. Burnett.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville. p 812-817, 1976. 1 tab.

Descriptors: *Swamps, *Waste water disposal, *Trees, *Growth rates, Wetlands, Florida, Water pollution effects, Sewage.

The average of the ratios comparing the growth of cypress trees during the enrichment period to that during the baseline period was 1.0 in the control dome and 2.6 in the sewage dome. While the cypress growth rate remained essentially unchanged during the enrichment period in the control plot, it more than doubled in the sewage-enriched plot. (See also W79-02256)(Steiner-Mass)
W79-02287

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science
For primary bibliographic entry see Field 4D.
W79-02293

A PALEOLIMNOLOGICAL COMPARISON OF BURNTSIDE AND SHAGAWA LAKES, NORTHEASTERN MINNESOTA,
Geological Survey, Denver, CO.
J. P. Bradbury
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 298, Price codes: A04 in paper copy, A01 in microfiche Publication No. EPA-600/3-78-004, January 1978. 50 p, 13 fig, 6 tab, 49 ref. P.O. No. 04J1PO-0605.

Descriptors: *Burntside Lake(MN), *Shagawa Lake(MN), *Trophic level, *Paleolimnology, *Eutrophication, *Limnology, Lakes, Minnesota, Oligotrophy, Diatoms, Primary productivity, Algae, Phytoplankton, Palynology, Lake restoration, Water pollution effects, Geology, Nutrients.

Paleolimnological studies of two adjacent lakes in northeastern Minnesota show that Burntside Lake has been less productive than Shagawa Lake for at least 2,000 years, long before the latter became enriched after 1886 with the arrival of white settlers. Causes for the natural difference in productivity are not clearly known, as both lakes occur within the same vegetation type and share much of their water. Differences may be due to relative size of drainage area and variations in bedrock geology. While settlement around Shagawa Lake has resulted in nutrient inputs which increased productivity and caused massive cyanophyte blooms, Burntside Lake has been spared intensive eutrophication. However, the diatom record of Burntside Lake indicates that nutrients derived from shoreside cabins and construction have been increasing the lake's productivity. Results suggest that paleolimnological studies may provide better comparative information for lake rehabilitation programs than do biological and chemical analyses of contemporary unpolluted water bodies. Shagawa Lake occupies a terrane of easily weathered metasedimentary and metavolcanic rocks; tributaries which cross this terrane bring dissolved ions and nutrients to the lake. Some groundwater probably enters Shagawa Lake along fracture zones as well, and can also carry nutrients. Burntside Lake lies in a dominantly granitic terrane whose rocks and minerals are slow to yield necessary ions for algal growth to the water. (Lynch-Wisconsin)
W79-02295

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO; APPENDIX A: PLANKTONIC COMMUNITIES, BENTHIC ASSEMBLAGES, AND FISHERY,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5E.
W79-02346

CONSIDERATIONS IN CONDUCTING BIOASSAYS,
WAPORA, Inc., Charleston, IL. Bioassay Lab.
For primary bibliographic entry see Field 5A.
W79-02349

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON, EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. E. Tatem, and J. H. Johnson.
Technical Report D-77-24, June 1978. 77 p, 11 tab, 9 fig, 26 ref, append.

Descriptors: *Washington, *Pollutants, *Aquatic environment, *Environmental effects, *Waste disposal sites, *Dredged material disposal, *Duwamish waterway(Wash), *Puget Sound(Wash).

A multidisciplinary approach studied physical, chemical, and biological effects of disposal of contaminated dredged material from the Duwamish River on a deepwater disposal site located in Elliott Bay. Observation of individual disposal events indicated that the sediment left the split-hull barges as a well-defined slug and reached the bottom in approximatedly 25 sec. A mound of dredged material 2.2 m high was created near the center of disposal site. No physical or chemical evidence indicated any of the material reached two reference sites located waste and west of the disposal site. Chemical analyses of in situ river sediment revealed concentrations of total sulfides and PCB's and interstitial water ammonia significantly higher than sediments from the disposal or reference sites. The disposal operation resulted in a rapid pulse of low levels of suspended solids in the water column which lasted less than 30 min. Increased levels of dissolved manganese and total PCB's in the water column were associated with the short-term increase in suspended particulate matter. Chemical analyses of animal tissues collected at the disposal and reference sites indicated the disposal operation did not result in higher levels of mercury a chromium in test animals. (WES)
W79-02350

TOXICITY, BOD, AND COLOR OF EFFLUENTS FROM NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, M. Le Bourhis, R. Wostradowski, and S. Prahacs.
Pulp and Paper Canada, Vol. 79, No. 7, p 41-47, (T235-T241), July, 1978. 2 appendices, 6 fig, 26 ref, 8 tab.

Descriptors: *Bleaching wastes, *Toxicity, *Biochemical oxygen demand, *Color, Fish, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Pulp wastes, Aquatic animals, Hardwood, Softwood, Pollutants, Chemical oxygen demand, Oxygen, Chlorine, Gases, Chlorination, Ozone, Kraft pulps, Bleaching, Chlorine dioxide, Hydrogen peroxide.

Fish toxicity data were obtained at the Pulp and Paper Research Institute of Canada for effluents from five novel high-consistency bleaching sequences for hardwood and softwood kraft pulps, viz., D(g)/P/D(g), C(g)/E(x)/D(g), O/C(g)/E(x), O/C/E, and O/D(g)/E(x), where g denotes treatment with the reagent in its gaseous form and E(x) is rapid-press caustic extraction. The O/D(g)/E(x) sequence produced the least toxic combined effluent which contained the smallest quantities of BOD, COD, and color. The lower residual chlorine concentrations of the C(g) as compared to the C effluents resulted in a lower toxicity. The calculated toxicities of E(x) effluents were less than those of E effluents at estimated steady-state conditions of multiple recycling of wash filtrates. This may be due to the use of C(g) instead of conventional C in the preceding bleaching stage. For a given pulp, both extraction methods produced similar quantities of BOD, COD, and color. Oxygen bleaching, followed by conventional chlorination and extraction treatments, does not reduce the toxicity but does reduce the BOD, COD, and color of the combined effluents. The color of combined effluents from bleaching sequences involving the use of D (chlorine dioxide) and/or P (peroxide) was lower than that of other combined effluents. (Swichtenberg-IPC)
W79-02374

FISH TEST WITH GOLDEN ORFE -- TESTING THE TOXICITY OF MATTER CONTAINED IN WATER (FISCHTEST MIT GOLDORFEN -- PRUEFUNG DER TOXIZITAET VON WASSERINHALTSSTOFFEN),
Technische Univ., Darmstadt (West Germany). Wasser und Abwasserforschungstelle.
L. Gottsching, and A. Geller.
Das Papier, Vol. 32, No. 5, p 201-208, May, 1978. 3 fig, 2 illus, 21 ref, 3 tab. English summary.

Descriptors: *Pulp wastes, *Toxicity, *Bioassay, *Fish, Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Suspended solids, Chemical oxygen demand, Mercury, Cadmium, Legal aspects, Europe, Legislation, Ammonium compounds, Sulfonates, Aquatic animals, Furfural, Golden orfe, False goldfish(Leuciscus idus melanotus), Guppies, West Germany.

According to the West Germany Waste Water Discharge Tax Law in force since January 1978, the harmfulness of water is determined by the following parameters: suspended solids, COD, mercury and cadmium contents, and toxicity to fish. The toxicity tests are compared for Germany, Great Britain, France, Italy, and the United States. Acute toxicity of water to fish is determined by dilution sequences. In Germany there is a test for guppies and a test for the golden orfe or false goldfish (Leuciscus idus melanotus), the latter being the subject of this study. The legal basis, limits of the test, and problems for the pulp and paper industry are discussed. The resuls of interlaboratory tests by a subcommittee of the German Committee on Detergents are reported, with emphasis on results relevant to the pulp and paper industry. Some toxic control substances of interest are quaternary ammonium compounds, sodium dodecyl sulfonate, and furfural. Basic problems of bioassay procedures are also treated. (Ward-IPC)
W79-02375

CONVERSION OF LIGNOSULFONATES IN NATURAL WATERS (PREVRASHCHENIE LIGNOSUL'FONATOV V PRIRODNYKH VODAKH),
Gidrokhemicheskii Inst., Novocherkassk (USSR).
For primary bibliographic entry see Field 5B.
W79-02379

AQUATIC VASCULAR PLANTS OF LAKE APOPKA, FLORIDA,
Georgia Coll., Nilledgeville. Inst. of Natural Resources.
For primary bibliographic entry see Field 2I.
W79-02420

THE RELEASE OF PLANT NUTRIENTS FROM REED BORDERS AND ITS TRANSPORT INTO THE OPEN WATERS OF THE BODENSEE-UNTERSEE, (IN GERMAN),
V. R. Schroder.
Archiv Hydrogiologie, Vol. 71(2), p 145-158. January, 1973. 5 fig, 3 tab, 8 ref.

Descriptors: *Wetlands, *Cycling nutrients, *Eutrophication, Nutrients, Phosphorus, Lakes, Marsh plants, Currents(Water).

The effect that reed borders have on eutrophication was investigated for a nutrient-rich and artificially eutrophied lake. In situ experiments provided the basis for calculating the daily amounts of phosphorus and nitrogen compounds that were released from the reeds. Measurements of the direction and velocity of the water current in the reed area indicated that the material released was carried to the lake by a bottom current while another current flows near the surface in the opposite direction. In the case of the Bodensee-Untersee, the littoral zone, which is partially inhabited by reeds, accounts for about 10% of the total phosphorus load. Owing to the seasonal fluctuations in the lake level and the resulting flooding of the littoral zone, a nutrient input occurs. The maximum of this nutrient input takes place when the phosphate concentration in the lake is at a minimum. Consequently, the eutrophying effect of the littoral zone can be importance for the total balance. (Steiner-Mass)
W79-02422

EFFECT OF DISSOLVED OXYGEN AND REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP AND MARSH SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
R. M. Engler, D. A. Antie, and W. H. Patrick, Jr.
Journal of Environmental Quality, Vol. 5, No. 3, p 230-235, 1976. 6 fig, 2 tab, 14 ref.

Descriptors: *Coastal marshes, *Nitrates, Wetlands, Marshes, Swamps, Muck soils, Nitrogen cycle, Fertilizer, Nutrients, *Dissolved oxygen, *Oxidation-reduction potential, *Nutrient removal.

Flooded and marsh soils in the flooded swamp and marsh soils in the interior swamp and coastal areas of Louisiana have a high capacity for removing NO sub 3 (-). Nitrate added either to the shallow floodwater or mixed in the soil rapidly disappeared under laboratory conditions. Nitrate loss does not take place in the floodwater, but is dependent on the NO sub 3(-) moving downward into the anaerobic soil layer. The NO sub 3(-) removal capacity is much greater than is required to handle any amount of No sub 3(-) -N that is likely to be present in these areas, either from oxidation of ammonium that has been released from organic matter or from NO sub 3(-) derived from local runoff from adjacent agricultural areas. Nitrate loss does not appear to be inhibited by the presence of a small amount of molecular O sub 2 in flooded soils. (Steiner-Mass)
W79-02426

EFFECTS OF AN ORGANIC ARSENICAL HERBICIDE ON A SALT MARSH ECOSYSTEM,
Auburn Univ., AL. Dept. of Biology; and Auburn Univ., AL. Dept. of Microbiology.
A. C. Edwards, and D. E. Davis.
Journal of Environmental Quality, Vol. 4, No. 2, p 215-219, 1975. 5 tab, 15 ref.

Descriptors: *Salt marshes, *Marsh plants, *Marine animals, *Arsenicals(Pesticides), Pesticide residues, Wetlands, Mussels, Arsenic compounds, Herbicides, Aquatic weed control, Pesticides, Bioassay, Hazards, Soil contamination, Water pollution sources.

The effects were investigated of single and repeat applications of monosodium methanearsonate on the standing crops of Spartina alterniflora (a marsh grass), Litorina irrorata (a periwinkle), and Modiolus demissus (a rib mussel). Post-treatment sampling revealed no alteration of the density of S. alterniflora; 30 applications of 10,000 ppm decreased the dry weight of living S. alterniflora, flowering shoot production was reduced by 30 applications of 10,000 or 1,000 ppm; one application of 90,000 ppm and 30 applications of 10,000 or 1,000 ppm increased the percentages of dead and necrotic tissue on living shoots; and the Littorina

population was decreased by 30 applications of 10,000 ppm. Survival of the rib mussel was not affected by flooding with 100 ppm in sea water. Arsenic levels in Spartina and soil samples were significantly increased by 30 foliar applications of 10,000 ppm or flooding 30 times with 100 ppm. Arsenic levels in Littorina and Modiolus also increased immediately following treatment. (Steiner-Mass)
W79-02427

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ONTARIO,
Ontario Ministry of the Environment, Toronto.
K. H. Nicholls, and H. R. MacCrimmon.
Journal of Environmental Quality, Vol. 3, No. 1, p 31-35, 1974. 3 fig, 2 tab, 18 ref.

Descriptors: *Marshes, *Land reclamation, *Nutrient cycling, Wetlands, Freshwater marshes, Nutrients, Nitrogen, Phosphorus, Marsh management, Drainage, Leaching, Fertilizers.

The combined effects of fertilization, drainage, and, hence, oxidizing and nitrifying conditions yield about 4 to 5 times more P and some 40 to 50 more nitrate-N in runoff water from cultivated over uncultivated marsh plots. Furthermore, the importance of overwinter leaching of P from frozen marsh vegetation has been indicated. The total P and nitrate-N lost in drainage water from the cultivated marsh plot are amounts which fall within the yearly range reported for several agricultural lands. The significance of the loading from the Holland Marsh, however, is that it is all released during a 5 to 6 week pumping period and that more than 90% of the P is in the soluble, reactive, orthophosphate form and is, therefore, available for algae and aquatic plant growth. The contribution of nutrients to the lower main channel of the marsh by the base flow of subsurface water from the fertilized and cultivated areas of marsh is considered negligible during the growing season. The reasons are the mean inorganic N and P concentrations in the subsurface water during the growing season are low and subsurface drainage presumably does not occur except when the pumps are draining the ditches in the early spring. (Steiner-Mass)
W79-02428

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS, DOCUMENT NO 2.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5E.
W79-02443

SOME HISTOPATHOLOGICAL EFFECTS OF AROCLOR 1254 ON THE LIVER AND GONADS OF RAINBOW TROUT, SALMO GAIRDNERI, AND CARP, CYPRINUS CARPIO,
Chelsea Coll., London (England). Dept. of Pharmacology; and Chelsea Coll., London (England). Dept. of Zoology.
K. Sivarajah, C. S. Franklin, and W. P. Williams.
Journal of Fish Biology, Vol 13, p 411-414, 1978. 2 fig, 18 ref.

Descriptors: *Fish reproduction, *Cytological studies, *Mode of action, *Rainbow trout, *Aroclor 1254, *Polychlorinated biphenyls, Pathology, Bioassay, Water pollution effects, Laboratory tests, Trout, Salmonids, *Carp, Reproduction, Fish physiology, Electron microscopy, *Histological studies, Liver, Gonads.

Sexually mature male and female rainbow trout (Salmo gaidneri) and carp (Cyprinus carpio) were injected intraperitoneally with Aroclor 1254 (25 mg/kg body weight in 1 ml of arachis oil) once weekly for four weeks. Arachis oil was used as the control. At the end of the fourth week, samples of the liver, testis and ovary were taken from treated and control fish and examined by light and electron microscopy. The light microscope study indicated that there was general vacuolation of the hepatocytes of trout but not carp; fragmentation of the developing oocytes but no observable changes in the testis. Electron microscopy study showed that there was enlargement of the rough endoplasmic reticulum of the hepatocytes, some damage to spermatozoa and proliferation of the smooth endoplasmic reticulum of the oocytes. (EIS-Katz)
W79-02452

THE EFFECTS OF POLYCHLORINATED BIPHENYLS ON PLASMA STEROID LEVELS AND HEPATIC MICROSOMAL ENZYMES IN FISH,
Chelsea Coll., London (England). Dept. of Zoology; and Chelsea Coll., London (England). Dept. of Pharmacology.
K. Sivarajah, C. S. Franklin, and W. P. Williams.
Journal of Fish Biology, Vol 13, p 401-409, 1978. 2 tab, 44 ref.

Descriptors: *Aroclor, *Polychlorinated biphenyls, Biochemistry, *Enzymes, *Metabolism, *Trout, Fish physiology, Chemical properties, Inhibitors, Mode of action, Cytological studies, *Carp, Water pollution effects, Toxins, Laboratory tests, Bioassay, *Hepatic microsomal enzymes, *Steroids, Hormones, *Cytochrome P450

Aroclor 1254 was administered intraperitoneally (25 mg/kg body weight in 1 ml of arachis oil) at weekly intervals for 4 weeks to trout and carp; arachis oil was used as the control. Activities of hepatic microsomal enzymes were measured in both species; cytochrome P450 and microsomal protein contents were also determined. The changes in the levels of androgens, oestrogens and corticoid hormones were measured in the circulating blood of control and treated groups at weekly intervals. The blood was obtained by cardiac puncture. Results indicated (a) a significant increase in the activities of all the enzymes measured except 1-leucyl-beta-naphthylamide splitting enzyme, (b) cytochrome P450 and microsomal protein contents were increased in trout, but not in carp, (c) a significant reduction in the plasma levels of androgens, oestrogens and corticoids in the treated groups, particularly at the end of the fourth week and (d) there was a correlation between increased enzyme activities and a decrease in plasma hormone levels. (EIS-Katz)
W79-02453

STUDIES OF THE ECOLOGY OF FISH POPULATIONS IN THE RYE MEADS SEWAGE EFFLUENT LAGOONS,
Chelsea Coll., London (England). Dept. of Pharmacology; and Chelsea Coll., London (England). Dept. of Zoology.
R. W. G. White, and W. P. Williams
Journal of Fish Biology, Vol 13, p 379-400, 1978. 12 fig, 9 tab, 49 ref.

Descriptors: *Fish populations, *Sewage lagoons, *Sewage effluents, *Growth rates, *Perches, *Fish reproduction, Biological communities environmental effects, Sewage, Freshwater fish populations, Biological communities, Aquatic populations, Nutrients, Sewage disposal, Sewage treatment, Lagoons, Productivity seasonal, On-site investigations, Roach, Chubs, Rutilus, Perca, Leuciscus.

The ecology of populations of roach, chub and perch in shallow lagoons forming part of a sewage works was studied over a period of two years. The fish were netted, identified, measured and scales taken for ageing, except in the case of perch of which a limited number were killed and their opercular bones collected. The chub and perch grew faster than those from other waters and the growth rate of the roach equalled that of the best European populations. Breeding success was irregular, particularly with the chub, and a relatively low population density and the high potential productivity of the lagoons could explain the rapid growth rate. (EIS-Katz)
W79-02454

THERMAL TOLERANCE AND PREFERENCE OF THE INDIAN CATFISH HETEROPNEUSTES FOSSILIS,
Delhi Univ. (India). Dept. of Zoology.
S. Vasal, and B. Sundararaj.
Environment Biology of Fish, Vol. 3, No. 3, p 309-315, 1978. 2 tab, 5 fig, 29 ref.

Descriptors: *Water temperature, Environmrntal effects, *Catfish, *Fish behavior, *Letal limit, Freshwater fish, Laboratory tests, Seasonal, Heated water, Temperature, Resistance, Methodology, *Indian Catfish, Hetropneustes, *Heterothermal environments, *Thermal tolerance, Thermal preference.

The catfish Heteropneustes fossils tolerates a wide range of temperatures. The minimal (7.9C) and maximal (39.8C) lethal temperature values obtained during summer are higher than the minimal (4C) and maximal (37.7C) lethal temperature values obtained during water; gradual heating or cooling versus abrupt exposure to various temperatures did not produce significant differences. Catfish acclimated to temperatures of 28 degrees (summer) or 16 degree C (winter) finally selected temperatures ranging from 31.3 degrees to 32 degrees C, when placed in a temperature gradient of 15 degrees to 35 degrees C. Catfish avoid temperatures below 25 degrees C regardless of seasonal acclimatization. (EIS-Katz)
W79-02455

ORGANOCHLORINE AND MERCURY RESIDUES IN FISH FROM LAKE SIMCOE, ONTARIO 1970-76,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab
For primary bibliographic entry see Field 5B.
W79-02456

INFLUENCE OF SILVER CARP (HYPOPHTALMICHTHYS MOLITRIX) ON PLANKTON OF SHALLOW WATERS ACCORDING TO INVESTIGATIONS IN CARP PONDS (WIRKUNGEN VON SILBERKARPFEN (HYPOPHTHALMICHTMYS MOLITRIX) AUF DAS PLANKTON IN FLACHCEWASSERN NACH UNTERSUCHUNGEN IN KARPFENTEICHEN),
Institut fuer Binnenfischerei, Berlin (East Germany).
D. Barthelmes, and K. Kleibs.
Internationale Revue Gesamten Hydrobiologie, Vol. 63, No. 3, p 411-419, 1978. 5 fig, 1 tab, 11 ref.

Descriptors: *Carp, *Plankton, *Aquiculture, *Aquatic populations, *Productivity, Fisheries, Fish stocking, Phytoplankton, Zooplankton, On-site data collections, Ponds, Fish management farm ponds, *Eutrophication, Fish food organisms, Cyanophyta, Hypophthalmichthys.

No severe changes take place in the plankton of highly eutrophic nonstratified water bodies under the climatic conditions of the GDR provided that stocking rates do not exceed 1,000 Si3/ha. In such waters it is possible to get an additional yield of 200 to 300 kg/ha with a stocking rate of 1,000 Si3/ha. This yield is based mostly on microphytoplankton and finer zooplankton, both fractions luxuriating with enhanced trophy. Stocking rates of the order of 10,000 Si3/ha allow selective overexploitation of microphytoplankton including bluegreens and nearly all zooplankton. This may be of interest to fishery management (also because of yields of up to 1 t/ha) as well as to water technology. (EIS-Katz)
W79-02457

THE CRUSTACEAN ZOOPLANKTON OF GRASMERE BEFORE AND AFTER A CHANGE IN SEWAGE EFFLUENT TREATMENT,
Freshwater Biological Association, Ambleside, (England).
W. J. P. Smyly
Internationale Revue Gesamten Hydrobiologie, Vol. 63, No. 3, p 389-403, 1978. 1 tab, 7 fig, 20 ref.

Descriptors: *Crustaceans, *Zooplankton, *Sewage effluents, *Plankton, *Sewage treatment, *Aquatic populations, Daphnia, On-site investigations, Biological communities, Water pollution effects, Oxygen, Domestic wastes, Water pollution sources, Copepods, Mollusks, Rotifers, Dissolved oxygen, Water quality, Seasonal, *Lake Grasmere(England).

The limnetic crustaceans of Grasmere, a small lake in the English Lake District, were studied from February 1969 to December 1970 (23 months) and from January to December 1975. These observations were made before and after a change in sewage effluent treatment effected in May 1971. Planktonic species, except for one cladoceran, were more abundant in the second that the first period, while hypolimnetic and profundal forms either became less abundant or modified their lifestyle in conjunction with a developing hypolimnetic oxygen-deficit. (EIS-Katz)
W79-02458

POSSIBLE TOXIC EFFECTS OF THE MARINE BLUE-GREEN ALGA, SPIRULINA SUBSALSA, ON THE BLUE SHRIMP, PENAEUS STYLIROSTRIS,
Arizona Univ., Tucson. Environmental Research Lab.
D. V. Lightner.
Journal of Invertebrate Pathology, Vol. 32, p 139-150, 1978. 9 fig, 1 tab, 19 ref.

Descriptors: *Aquiculture, *Shrimp, *Commercial shellfish, *Animal diseases, *Cyanophyta, *Toxicity, *Marine algae, Eutrophication, Microbiology, Animal pathology, Microorganisms, Marine bacteria infection, Aquatic microorganisms, Invertebrates, Crustaceans, Epizootiology, Spirulina, Penaeus, Vibrio, *Toxigenic algae, *Histology.

Blooms of a marine species of blue-green algae identified as Spirulina subsalsa were found to be related to a particular disease syndrome in raceway-reared blue shrimp, Penaeus stylirostris. The disease was characterized by necrosis of the lining epithelium of the midgut, dorsal cecum, and hindgut gland, and a consequent hemocytic enteritis. Bacterial infections due predominantly to Vibrio alginolyticus were common in affected shrimp and presumed to be a secondary condition resulting from necrosis of the gut epithelium. These bacterial infections were expressed as local abscesses near or on the gut or as fulminating septicemias. (EIS-Katz)
W79-02459

FURTHER DATA ON HEAVY METALS AND ORGANOCHLORINES IN MARINE MAMMALS FROM GERMAN COASTAL WATERS,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
For primary bibliographic entry see Field 5B.
W79-02460

ECOLOGICAL EFFECTS OF COOLING WATER OF A POWER PLANT AT KIEL FJORD,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
H. Moller.
Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 3-4, p 117-130, 1978. 7 fig, 6 tab, 49 ref.

Descriptors: *Water temperature, Powerplants, Cooling water, *Zooplankton, *Fish, Food organisms, *Discharge(Water), Benthic fauna, Productivity, Environmental effects, Benthos, Currents(Water), Biological communities, Aquatic environment, Movement, Eels, Mussels, Ecosystems, *Kiel fjord, *Impingement.

Effects of temperature increase are of little importance when compared with effects of artificial currents. Near the discharge as well as near the intake increased transport of planktonic food causes an elevated production of zoobenthos. Cod and eel are attracted into this area because of favourable food conditions. There is no rise in the incidence of fish infected with parasites or diseases in the outlet area. The number of fish damaged at the intake screens is low. Settling of blue mussel and barnacles in relatively deep bottom regions near the discharge indicates a good supply of oxygen in this area. Changes in the macrobenthic fauna due to plant operation were limited to an area of about 0.01 sq km. There was a mass invasion of shore crabs and eels into the discharge area after a close down of the plant in the summer. Ten days after the close down, the benthic population in front of the plant was reduced sharply. (EIS-Katz)
W79-02461

INFLUENCE OF WATER SOLUBLE EXCRETA ON OXYGEN CONSUMPTION OF TILAPIA ZILLII,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
H. Schulze-Wiehenbrauck.
Berichte der Deutshen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 3-4, p 131-136, 1978. 1 fig, 4 tab, 15 ref.

Descriptors: *Tilapia, Water quality, Environmental effects, *Metabolism, *Fish physiology, *Respiration, *Nitrogen compounds, Freshwater fish, Aquatic animals, Juvenile growth stage, Methodology, Nitrogen, Oxygen, *Oxygen demand, Laboratory tests, Water pollution effects, Nitrogen cycle, Excreta, *Fish wastes.

The influence of water, conditioned with fish excreta, was tested by measuring the oxygen consumption of juvenile Tilapia zillii (0.7 to 24.8 g wet weight). The results indicate a slight increase of aerobic metabolism in a loaded water regime, thus confirming other results found in crowded conditions, where fish metabolism was increased and energy utilization decreased. Single fish showed a reduced oxygen consumption, compared with the mean of grouped fish. (EIS-Katz)
W79-02462

UPTAKE, RETENTION AND LOSS OF CADMIUM BY BROWN SHRIMP, (CRANGON CRANGON),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
For primary bibliographic entry see Field 5B.
W79-02463

ON THE UPTAKE OF THREE DIFFERENT TYPES OF HYDROCARBONS BY SALMON EGGS (SALMO SALAR L.),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
W. W. Kuhnhold, and F. Busch.
Berichte der Deutschen Wissenschaftlicher Kommision fur Meeresforschung, Vol 26, No 1-2, p 50-59, 1978. 20 ref, 3 fig, 4 tab.

Descriptors: *Absorption, *Fish eggs, *Salmonids, *Metabolism, Hatching, *Biological membranes, Fish reproduction, Water pollution effects, Organic compounds, Environmental effects, Laboratory tests, Growth stages, Fish physiology, Biochemistry, Membrane processes, *Bioaccumulation, *Naphthalene, *Benzopyrene, Penetration.

This study compares the difference in accumulation of carbon radioactive naphthalene, 3,4-benzopyrene and n-hexadecane in salmon eggs (Salmo salar) just prior to hatching. The test concentrations ranged from 4.6 to 13.9 ppb and also 0.2 ppb for naphthalene. Whole eggs as well as single dissected parts of eggs were analysed for hydrocarbon uptake with time. The comparison of the regression coefficient b of the accumulation equation, $\log y = \log a + b \log x$, show a similar behavior for naphthalene and benzopyrene and a much slower accumulation and penetration for hexadecane which is even lower than for a naphthalene solution of 1/20 concentration. The penetration (portion of penetrated hydrocarbon to total accumulation) is fastest in naphthalene; 98% in 12 hours, 85% for benzopyrene. In hexadecane the penetration seems to slow down, the portion accumulated on the chorion increases. Hydrocarbons that penetrated the chorion are accumulated most in the yolk and egg fluid. The data are discussed in regard to possible hydrocarbon metabolism. (EIS-Katz)
W79-02464

EFFECTS OF SOME ENVIRONMENTAL FACTORS ON GROWTH AND FOOD CONSUMPTION OF THE BALTIC PALAEMONID SHRIMP, PALAEMON ADSPERSUS VAR. FABRICII (RATHKE),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
N. M. Inyang.
Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 1-2, p 30-41, 1978. 29 ref, 8 tab, 3 fig.

Descriptors: *Salinity, Environmental effects, *Growth rates, *Water temperature, *Shrimp, *Diets, *Metabolism, *Aquiculture, Laboratory tests, Temperature, Crustaceans, Invertebrates, Commercial shellfish, Fish diets, Fish food organisms, Brine shrimp, Palaemon, *Artemia.

Experimental studies with Palaemon adspersus var. fabricii show that its growth rate is influenced by the amount and kind of food, water temperature and salinity. The average growth rate of the shrimp on half the normal daily food intake (feeding with adult Artemia) reached about 40% of the weight increase of the individuals fed to satiation. Feeding with Artemia and Crangon gave a better growth rate than with Mytilus and Tubifex. The percentage weight increase at 20C was twice that at 15C. At 20C growth was better at 18% salinity than at 10% and 35% salinities. The amount of food (adult Artemia) consumed by the shrimp (av. length 30 mm) at 20C was about 4.5 mg (dry weight) per shrimp per day. Food consumption and food conversion efficiency was higher at 20C than at 15C. Salinity also influenced the amount of food intake. (EIS-Katz)
W79-02465

THE INFLUENCE OF SALINITY AND TEMPERATURE ON GROWTH, METABOLISM AND LETHAL TEMPERATURE OF THE SAND GOBY, POMATOSCHISTUS MICROPS K. (DER EINFLUSS VON SALZGEHALT UND TEMPERATUR AUF WACHSTUM STOFFWECHSEL UND LETALTEMPERATUR DER STRANDGRUNDEL POMATOSCHISTUS MICROPS K.),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
W. Tolksdorf.
Berichte der Deutschen Wissenschaftlicher Kommission fur Meeresforschung. Vol. 26, No. 1-2, p 15-29, 1978. 32 ref, 6 tab, 4 fig, In German with English Abstract.

Descriptors: *Salinity, *Water temperature, *Metabolism, *Adaptation, *Growth rates, *Feeding rates, Environmental effects, Fish physiology, Osmoregulation, Habitats, Temperature, Water properties, Laboratory tests, Lethal limit, Pomatoschistus, *Sand Gobies, *Osmoregulation.

Sand gobies Pomatoschistus microps were adapted to 4,5%, 9%, 13,5% and 18% salinity at 15C and 20C. Food intake, growth and metabolism were tested at adaptation temperature, further the reaction of metabolism was tested to continuously increased temperature up to 32C. Upper lethal temperature was determined by further continuously increased temperature. A long-term adaptation of P. microps to a salinity of 4.5% at 20C is not possible, but no problem was encountered in keeping the fish at other combinations of temperature and salinity. The lethal temperature for fish acclimated to 15C increases with increasing salinity from 4,5% to 13,5%. No special energy demand for osmoregulation could be determined. (EIS-Katz)
W79-02466

NET-AND NANOPLANKTON: EFFECTS OF AN OIL SPILL IN THE NORTH SEA,

Nordic Council for Marine Biology, Blomsterdalen (Norway).
C. Lannergren.
Botanica Marina, Vol. 21. p 353-356, 1978. 3 fig, 2 tab, 13 ref.

Descriptors: *Oil spills, *Nannoplankton, *Photosynthesis, Oil, Oil pollution, Biomass, Productivity, Diatoms, Trophic level, Offshore platforms, Herbivores, Phytoplankton, Toxicity, Growth rates, Water pollution effects, *Crude oil, *North Sea.

Following an oil spill in the North Sea carbon assimilation and biomass of phytoplankton were studied in three size fractions, greater than 30 micro m, 5-30 micro m, and less than 5 micro m. No harmful effects were detected; on the contrary the largest biomass and production occurred in the most contaminated water, containing about 260 ppb of petroleum hydrocarbons. The higher values were associated with the fraction greater than 30 micro m, presumably diatoms. It is uncertain if this was a direct effect, or the result of reduced grazing by herbivores in the presence of oil. (EIS-Deal)
W79-02467

THE NUTRIENT CONTENTS OF NORTH SEA WATER: CHANGES IN RECENT YEARS, PARTICULARLY IN THE SOUTHERN BIGHT,

Nederlands Inst. voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5B.
W79-02468

A MODEL OF THE BIOLOGICAL EFFECTS OF EUTROPHICATION IN THE NORTH SEA,

Danmarks Fishkeri- og Havundersogelser, Charlottenlund.
E. Ursin, and K. P. Andersen.
Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration De La Mer, Vol. 172, p 366-377, 1978. 4 tab, 14 ref.

Descriptors: *Mathematical models, *Phosphorus, *Nutrients, *Model studies, Eutrophication, Trophic level, Nutrient requirements, Ecosystems, Primary productivity, Phytoplankton, Aquatic populations, Municipal wastes, Sewage effluents, Commercial fish, Fish production, *North Sea.

In a model of the pathways of phosphorus through the North Sea ecosystem, first, a steady supply of nutrients from rivers, etc. was simulated, and next, an increasing supply. With apparently realistic data for water exchange and nutrient supply the model predicted a slight increase in the yield of fish, far from sufficient to describe the observed yield increase over the period 1960-1970. Recommendations for modification of several parameters of the model were offered. (EIS-Deal)
W79-02469

A METHOD OF PREDICTING THE BIOLOGICAL EFFECTS OF SYNTHETIC POLLUTANTS IN THE NORTH SEA,

Danmarks Fishkeri- og Havundersogelser, Charlottenlund.
H. Lassen.
Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration De La Mer, Vol. 172, p 378-383, 1978. 2 tab, 7 ref.

Descriptors: *Model studies, *Mathematical models, *DDT, *Polychlorinated biphenyls, Fish populations, Aquatic populations, Persistence, Pesticide kinetics, Pesticide residues, Organic compounds, Food webs, Productivity, Primary productivity, Trophic level, Fish reproduction, Mortality, Biomass, *North Sea, *Non-degradable compounds.

The ecomodel of Andersen and Ursin is extended to include a non-degradable chemical compound such as DDT or PCB. A simplified 'sea' holding four species is used to illustrate some features of the model. (EIS-Deal)
W79-02470

BLOOD CORPUSCLE RESISTANCE OF CARP DIED OF ENVIRONMENTAL HYPOXIA AND OF CYANIDE POISONING, (IN JAPANESE),

Hiroshima Univ. (Japan). Dept. of Fisheries.
S. Murachi, K. Nanba, and A. Hikite
Journal of the Faculty of Fisheries and Animal Husbandry of Hiroshima University, Vol. 17, p 91-96, 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Fish diseases, *Mortality, *Toxicity, *Carp, Fish physiology, Cytological studies, Oxygen requirements, Poisons, Fishkill, Anaerobic conditions, Oxygen, *Hypoxia, Tissue analysis, *Cyanide, Red blood cells

Blood corpuscle resistance (BCR) of carp was significantly lowered immediately after death by environmental hypoxia, while it remained at the same level as the normal one when the fish died of cyanide poisoning. However, 24 hours after the fish were dead, the BCR decreased in the case of death by cyanide poisoning, whereas it increased in the case of death by environmental hypoxia, when compared with its level immediately after death. The results indicate that the measurement of BCR of fish within several hours after death may be applicable in judging whether the cause of fish death was environmental hypoxia. (EIS-Deal)
W79-02471

EFFECTS OF BURIAL ON THE HEART COCKLE CLINOCARDIUM NUTTALLII AND THE DUNGENESS CRAB CANCER MAGISTER,

Fisheries and Marine Service, West Vancouver (British Columbia)
B. D. Chang, and C. D. Levings.
Estuarine and Coastal Marine Science, Vol. 7, p 409-412, 1978. 2 tab, 9 ref.

Descriptors: *Crabs, *Dredging, Animal behavior, Spoil banks, Mortality, Sand, Bottom sediments, Benthic fauna, *Waste disposal, Waste dump, Crustaceans, Environmental effects, *Mulluscs, *Heart cockle, Clinocardium, Dungrass crabs

Burial experiments with dredge spoil sand were performed in the laboratory using heart cockle and the Dungegrass crab. All cockles buried by 5 cm or less re-established siphon contact with water in less than 24 h. Under 10 cm of sand, less than 50% reached the surface within 24 while none did so under 20 cm sand. All crabs reached the surface in less than 24 h burial by 10 cm or less of sand, while none did so under 20 cm. (EIS-Deal)
W79-02472

EFFECTS OF THERMAL DISCHARGES ON MORTALITY OF MERCENARIA MERCENARIA IN BARNEGAT BAY, NEW JERSEY,

Jersey Central Power and Light Co. Morristown, NJ. Environmental Affairs Dept.
M J Kennish
Environmental Geology, Vol. 2, No. 4, p 223-254, 1978. 16 fig, 27 tab, 49 ref.

Descriptors: *Mollusks, *Mortality, *Thermal pollution, *Clams, Animal populations, Heated water, Water temperature, Growth rates, Life history studies, Seasonal, Animal physiology, Nuclear powerplants, Benthic fauna, Animal behavior, Growth stages, New Jersey, *Barnegat Bay(NJ).

Thermal discharges from the Oyster Creek Nuclear Generating Station do not affect mortality in natural populations of Mercenaria mercenaria in Barnegat Bay, New Jersey. The analyses of daily growth increments and disturbance bands in shell cross-sections of death assemblages of the pelecypods collected at the mouth of Oyster Creek (strongly affected by thermal discharges) and at three control sites (unaffected by thermal discharges) in the bay indicate that similar mortality patterns exist in all assemblages. This is revealed by mortality rate curve, survivorship curves, and life tables, which are nearly identical for each assemblage. (EIS-Deal)
W79-02473

ECO-BIOCHEMICAL STUDIES ON SOME ECONOMICALLY IMPORTANT INTERTIDAL ALGAE FROM PORT OKHA (INDIA),

Saurashta Univ., Rajkot (India). Dept. of Biosciences.
M. S. Murthy, and P. Radia.
Botanica Marina, Vol. 21, p 417-422, 1978. 7 fig, 1 ref

Descriptors: *Marine algae, *Primary productivity, *Protein, Biochemistry, Ecosystems, Niches, Chemical analysis, Water temperature, Hydrogen ion concentration, Salinity, Cytological studies, Photosynthesis, Lipids, Carbohydrates, Sodium, Potassium, Calcium, Phosphorus, Metabolism, Aquiculture, Ulva, Gelidiella, Sargassum

An attempt was made to study the biochemical contents of Ulva lactuca, Gelidiella acerosa, and Sargassum swartzii and to correlate them with ecological factors of the marine environment. There was a close relationship between the net primary productivity and protein content in S. swartzii. An inverse relation existed between crude fat and crude fibre content in all 3 algae studied. Factors like temperature, salinity, pH had no bearing on the different biochemical contents of the algae. Water deficiency due to more exposure and consequently increased light in the case of S. swartzii and G. acerosa enhanced fat formation. (EIS-Deal)
W79-02475

GROWTH-INFLUENCING SUBSTANCES IN SEDIMENT EXTRACTS FROM A SUBTROPICAL WETLAND: INVESTIGATION USING A DIATOM BIOASSAY,

Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Biology and Living Resources.
K. E. Cooksey, and B. Cooksey
Journal of Phycology, Vol. 14, p 347-352, 1978. 3 fig, 3 tab, 28 ref.

Descriptors: *Diatoms, *Growth rates, *Plant growth substances, *Mangrove swamps, *Bioassay, Inhibition, Inhibitors, Sediments, Seasonal, Organic compounds, Biochemistry, Metabolism, Plant physiology, Ecosystems, Wetlands, *Heterotrophy, *Mixotrophy, Amphora

A biological assay using Amphora coffeaeformis perpusilla and A. coffeaeformis was used to investigate the changes in the properties of soluble organic carbon in sediments taken from a coastal wetland. During January to May, sediment extracts became increasingly inhibitory to diatom growth. After the onset of the spring rains, the inhibitory properties of the extracts disappeared. Substances capable of promoting mixotrophic growth and heterotrophic growth were found in extracts taken in July to December. These positive responses took place at the time of mangrove leaf fall. (EIS-Deal)
W79-02476

EFFECT OF METHALLIBURE ON THE HYPOPHYSIS AND GONADAL DEVELOPMENT OF THE CICHLID FISH, TILAPIA MOSSAMBICA,

Niigata Univ. (Japan). Biological Lab.
A. Chiba, Y. Honma, and W. J. R. Lanzing.
Japanese Journal of Icthyology, Vol. 25, No. 2, 107-114, 1978. 6 fig, 1 tab, 20 ref.

Descriptors: *Cichlids, *Fish reproduction, Growth stage, Growth rates, Inhibition, Reproduction, *Cytological studies, Juvenile growth, Toxicity, Fish physiology, Animal metabolism, Biochemistry, Bioassay, *Tilapia, Tissue analysis, *Methallibure, *Hypophysis, Hormones

The present paper describes histological and cytological changes in the hypophysis and gonads of juvenile Tilapia mossambica exposed to the anti-gonadotropic drug methallibure. This treatment markedly inhibited the process of maturation and gametogenesis in both sexes, in addition to retardation of differentiation of interstitial cells and epithelial lining of the efferent duct of the testis. T

olygonal basophils (gonadotrophs) located in the ntral portion of the proximal pars distalis of the pophysis underwent a marked decrease in cell e as well as in the amount of cytoplasmic gran- es of glycoproteinaceous nature. Atrophy was nifested by the acidophils (somatotrophs) of the oximal pars distalis and the PAS positive cells of e pars intermedia, whereas no appreciable ange was recognized in other cell types of the enohypophysis. (EIS-Deal)
79-02477

ETERMINATION OF METHYLMERCURY FISH OF SOUTH CAROLINA,
uth Carolina State Coll., Orangeburg. Dept. of tural Sciences.
r primary bibliographic entry see Field 5A.
79-02478

RGANCHLORINES IN CODFISH FROM ARBOURS ALONG THE NORWEGIAN OAST,
rges Veterinarhoegskole, Oslo. Dept. of Phar- cology and Toxicology.
M. Brevik, J. E. Bjerk, and N. J. Kveseth.
lletin of Environmental Contamination and xicology, Vol. 20, p 715-720, 1978. 1 fig, 1 tab, 8

scriptors: *Polychlorinated biphenyls, *DDT, esticide residues, Industrial wastes, Fungicides, ecticides, Chlorinated Hydrocarbon pesticides, ticide kinetics, Chemical analysis, Water analy- Chemical wastes, Path of pollutants, Orgaic npounds, Commercial, Fish, *Organochlorines, sue analysis, *Bioaccumulation, *Cod, exachlorobenzene(HCB), *Norway, Oslo Fjord, gen Kristiansand.

vels of PCBs, HCB and sum-DDT found in fish liver obtained near the harbours of several ns located along the coast of Norway, are erally low. The degree of contamination ap- red to be somewhat higher in the Oslo fjord than at the other sampling sites. Exceptions to general picture were Bergen (high levels of -DDT and PCBs) and Kristiansand harbour h levels of HCB). (EIS-Deal)
9-02479

FECT OF HEXACHLOROBENZENE (HCB) PHOTOSYNTHETIC OXYGEN EVOLU- ON AND RESPIRATION OF CHLORELLA RENOIDOSA,
ogische Bundesanstalt fuer Land- und stwirtschaft, Berlin (West Germany). Inst. fuer ntparasitare Pflanzenkrankheiten.
Geike, and C. D. Parasher.
letin of Environmental Contamination and icology, Vol. 20, p 647-651, 1978. 1 fig, 1 tab, 6

criptors: *Chlorella, *Photosynthesis, *Respi- on, *Toxicity, Chlorophyta, Algae, Oxygen, abolism, Inhibition, Organic compounds, Per- nce, Cytological studies, Chemical properties, xachlorobenzene(HCB).

xperiments with Chlorella pyrenoidosa it was vn than an exposure of these cells to HCB at a level of 0.1, 1.0, and 5.0 ppm caused an bition of photosynthetic oxygen evolution of 42, and 51%, respectively. Respiration, how- was inhibited only slightly, if at all. (EIS-)
-02480

EFFECT OF SILT-FENCE ON THE PRE- TION OF SEA WATER SILTATION SED BY DREDGING AND RECLAIMING RK IN HARBOR, (IN JAPANESE),
xaido Regional Fisheries Research Lab. an).
ato.
etin of the Holkaido Regional Fisheries Re- h Laboratory, No. 43, p 53-57, 1978. 1 fig, 2 ref.

Descriptors: *Dredging, *Suspended solids, *Silts, Channel improvement, Sea water, Salinity, Turbidity, *Waste disposal, Waste dumps, Solid wastes, Water pollution sources, Reclamation, *silt-fence, *Iwanai Harbor(Japan).

The use of silt-fence seemed to be highly efficient in the prevention of dispersion of the drain from the dredging and reclaiming work in Iwanai harbor (Japan). It was pointed out that caution is necessary in dealing with the re-deposit inside the silt-fence. (EIS-Deal)
W79-02481

THE POLLUTION OF SEA-WATER IN NAGASAKI BAY IN SUMMER 1976 AND 1977, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W79-02482

MICROORGANISMS AND HEAVY METAL TOXICITY,
University Coll., Cardiff (Wales). Dept. of Microbiology.
G. M. Gadd, and A. J. Griffiths.
Microbial Ecology, Vol. 4, p 303-317, 1978. 120 ref.

Descriptors: *Heavy metal, *Toxicity, *Microorganisms, *Microbiology, Physiology, Metabolism, Resistance, Chemical properties, Chemical reactions, Biochemistry, Ions, Cytological studies, Genetics, Adaptation, Bacteria, *Mercury, *Cadmium, Microbial degradation, Fungi, Chemical degradation, Absorption, Nickel, Cobalt, Zinc, Manganese, Magnesium, Calcium, Biotransformation, Bioaccumulation, *Methylmercury, *Detoxification.

The environmental and microbiological factors that can influence heavy metal toxicity are discussed with a view to understanding the mechanisms of microbial metal tolerance. It is apparent that metal toxicity can be heavily influenced by environmental conditions. Binding of metals to organic materials, precipitation, complexation, and ionic interactions are all important phenomena that must be considered carefully in laboratory and field studies. It is also obvious that microbes posses a range of tolerance mechanisms, most featuring some kind of detoxification. Many of these detoxification mechanisms occur widely in the microbial world and are not only specific to microbes growing in metal-contaminated environments. (EIS-Deal)
W79-02483

EFFECT OF BARITE (BASO4) ON DEVELOPMENT OF ESTUARINE COMMUNITIES,
Environmental Research Lab., Gulf Breeze, FL.
M. E. Tagatz, and M. Tobia.
Estuarine and Coastal Marine Science, Vol. 7, p 401-407, 1978. 1 fig, 3 tab, 11 ref.

Descriptors: *Oil wells, *Toxicity, *Drilling fluids, *Mud., *Biological communities, Drilling, Sulfates, Estuaries, Plankton, Sand, Larval growth stage, Annelids, Mollusks, Growth rates, Clams, Benthic fauna, *Barite, *Barium compounds.

Barite, the primary component of oil drilling muds, affected the composition of estuarine communities developed from planktonic larvae in aquaria containing sand and flowing estuarine water. Annelids were particularly affected and significantly fewer were found in all treatments than in the control. Mollusks decreased markedly in number only in barite-covered aquaria. Barite, however, did not impede growth of the abundant clam, Laevicardium mortoni, or decrease abundance of six other phyla. Our data indicate that large quantities of this compound, as discharged in offshore oil drilling possibly could adversely affect the colonization of benthic animals. (EIS-Deal)
W79-02484

THE EFFECTS OF PETROLEUM ON THE SALT MARSH ECOSYSTEM,
College of William and Mary, Williamsburg, VA. Dept. of Marine Sciences.
J. L. Lake.
PhD Dissertation, 1977. 137 p.

Descriptors: *Salt marshes, *Oil, *Water pollution effects, *Marsh plants, *Aquatic animals, Wetlands, Coastal marshes, Morbidity, Water pollution, Environmental effects, Pollutants, Sediments, Organic compounds.

The research examines the effects of chronic, low level oil pollution on salt marsh ecosystems. Two marshes were dosed monthly with No. 2 fuel oil while a third served as a control. In the first marsh the distribution and incorporation of oil into Spartina alterniflora and sediments were determined. Examination of the alkane fraction extracted from the sediment showed a decrease in the concentrations of n-alkanes relative to that of the isoprenoids, pristane, and phytane, eight to nineteen weeks after the final oil dosing. The most significant consequence of the low level dosing was the damage to the S. alterniflora. Loss of grass production due to the oiling was estimated at 52.5%. Plant mortality resulted in extensive erosion of the underlying peat and sediment in areas of oil accumulation. Recovery has been slow. The second marsh was examined in terms of the accumulation, retention, and in situ depuration of petroleum compounds by four marsh organisms: Modiolus demissus, Crassostrea virginica, Littorina irrorata, and Nereis succinea. Except for the saturates of Littorina irrorata, the organisms rapidly depurated the petroleum compounds which they had accumulated during dosing. However, it appears that some organisms accumulated or selectively retained some aromatic hydrocarbons during depuration. (Steiner-Mass)
W79-02485

DIFFERENTIAL ELIMINATION OF PHENOL BY DIATOMS AND OTHER UNICELLULAR ALGAE FROM LOW CONCENTRATIONS,
Marburg Univ. (West Germany). Gachbereich Biologie.
D. Werner, and H. Pawlitz.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 303-312, No. 3, 1978. 8 fig, 23 ref.

Descriptors: *Phenols, *Metabolism, *Diatoms, *Algae, *Absorption, Chlamydomonas, Chlorella, Euglena, Scenedesmus, Path of pollutants, Bioindicators, Growth rates, Chemical properties, Biodegradation, Phytoplankton.

The comparative efficiency of several unicellular algae at eliminating phenol was examined. The uptake and elimination kinetics were reported for each of the 11 organisms studied. Anacystis, Euglena, Chlorella, and Scenedesmus were the most efficient strains. (EIS-Deal)
W79-02486

INSECTICIDE PERSISTENCE IN NATURAL SEAWATER AS AFFECTED BY SALINITY, TEMPERATURE, AND STERILITY,
Gulf Coast Research Lab., Ocean Springs, MS. Microbiology Section.
For primary bibliographic entry see Field 5B.
W79-02487

ETHYLMERCURY: FORMATION IN PLANT TISSUES AND RELATION TO METHYLMERCURY FORMATION,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W79-02488

STUDIES ON THE EFFECTS OF THE ENVIRONMENT ON THE HEART RATE OF SHELLFISHES. II. EFFECTS OF TEMPERATURE, LOW SALINITY AND HYPOXIA ON THE HEART RATE OF AN ABALONE HALIO-

TIS (NORDOTIS) DISCUS HANNAI INO. (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
T. Nakanishi.
Bulletin of the Hokkaido Regional Fisheries Research Laboratory, No. 43, p 59-68, 1978. 7 fig, 5 ref.

Descriptors: *Animal physiology, *Water temperature, *Salinity, *Oxygenation, Oxygen, Oxygen requirements, Toxicity, Mortality, Shellfish, Commercial shellfish, Heated water, Sea water, *Abalone, Heart rate.

The effect of temperature on the heart rate was studied at eight temperatures from -1.8C to 33C at 5 degree intervals. At the highest and lowest temperatures every abalone died. In general, heart rate increased with temperature, reaching a maximum rate at 28C. When the effect of salinity was examined it was noted that heart rate decreased with salinity. As for the effect of oxygen saturation, above 30% the heart rate increased, while below 30% it decreased. (See also W77-11265) (EIS-Katz)
W79-02497

EFFECTS OF INGESTING MERCURY-CONTAINING BACTERIA ON MERCURY TOLERANCE AND GROWTH RATES OF CILIATES,
Maryland Univ., College Park. Dept. of Microbiology.
S. G. Berk, A. L. Mills, D. L. Hendricks, and R. R. Colwell.
Microbial Ecology, Vol. 4, p 319-330, 1978. 2 fig, 5 tab, 26 ref.

Descriptors: *Protozoa, *Mercury, *Resistance, *Adaptation, Bacteria, Mortality, Evolution, Growth rates, Heavy metals, Toxicity, Animal populations, Pseudomonas, Chesapeake Bay, Food chains, Path of pollutants, Uronema.

The ciliate Uronema nigricans was found to acquire tolerance to mercury after being fed mercury-laden bacteria followed by exposure of washed suspensions of these ciliates to various concentrations of mercury in solution. Significant differences in percent mortality were observed for ciliates fed mercury-laden bacteria compared with control suspensions fed mercury-free bacteria. The phenomenon of acquired mercury tolerance was demonstrated within a single generation time. The effect of ingesting mercury-laden bacteria on growth rate of Uronema was examined, and results showed no significant differences in growth rates of both 3- and 14-day-old cultures of protozoa that had been fed mercury-laden and mercury-free bacteria under controlled conditions. (EIS-Deal)
W79-02499

THE URQUIOLA OIL SPILL, LA CORUNA, SPAIN: IMPACT AND REACTION ON BEACHES AND ROCKY COASTS,
South Carolina Univ., Columbia. Dept. of Geology.
E. R. Gundlach, C. H. Ruby, M. O. Hayes, and A. E. Blount.
Environmental Geology, Vol 2, No 3, p 131-143, 1978. 14 fig, 1 tab, 14 ref.

Descriptors: *Oil spills, *Beaches, *Coasts, Oil, Oil pollution, Sands, Particle size, Waves(Water), Tides, Path of pollutants, Water pollution effects, Sediments, *Crude oil, *Spain, Tanker Urquila, Rocky coasts.

The impact and interaction of oil on fine-sand, coarse-sand, and gravel beaches and on sheltered and exposed rocky coasts was monitored in detail. The surficial distribution of oil on the beaches was influenced primarily by wave activity, tidal stage, and oil quantity. Heaviest accumulations formed along the high-tide swash line. Within beach sediments, oil was present at distinct oiled sediment layers, which were often deeply buried. The depth of burial was related to wave energy and sediment type. The thickness of oiled sediment depended on sedimentary characteristics, the quantity of oil present, and wave action and capillary forces. (EIS-Deal)
W79-02500

5D. Waste Treatment Processes

A SURVEY OF PHOSPHORUS AND NITROGEN LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5A.
W79-02003

EPA'S CONSTRUCTION GRANTS PROGRAM: PERSPECTIVES COSTS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-02027

ECONOMIC EVALUATION OF FOUR SLUDGE DEWATERING DEVICES,
T. Viraraghavan, and R. C. Landine.
Pollution Engineering, Vol 10, No 9, p 55-57, Sept 78. 5 fig, 2 tab.

Descriptors: *Sludge treatment, *Dewatering, *Waste water treatment, Equipment, *Alternative costs, *Sludge disposal, Alternative planning, Decision making, Economics, Evaluations, Canada, New Brunswick(Canada), Vacuum filters, Centrifugation, Filter presses, Belt filter presses, Filters, Filtration, Technology, Cost-effectiveness.

Four sludge dewatering methods (vacuum filter, centrifuge, filter press, and belt filter press) were evaluated in terms of technology and economics for use in a proposed municipal wastewater treatment plant in New Brunswick, Canada. The sludge treatment system consists of thickening a mixture of primary and secondary sludge, chemical conditioning, dewatering by one of the four mechanical dewatering units, and ultimate disposal in a landfill. Preliminary economic evaluation (total costs) showed that centrifuges ($46-65/ton dry solids) and belt filter presses ($45-63/ton dry solids) are both cost-effective for the case studied. Filter presses are most expensive ($80-100/ton dry solids), followed by vacuum filters ($58-68/ton dry solids). While the vacuum filter system had the lowest total capital costs ($95,700), the annual operation and maintenance costs of the belt filter press ($29,000) and centrifuge ($34,600) were considerably lower than the other two options. Capital costs for the other three systems ranged from $109,800 to $139,400; annual operating costs were $46,400 for vacuum filters and $61,400 for filter presses. (Lynch-Wisconsin)
W79-02037

COORDINATING PUBLIC UTILITY EXPANSION, INDUSTRIAL SITING AND POLLUTION CONTROL: A WORKING DYNAMIC PROGRAMMING ALGORITHM,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02039

NEW PULP MILL STRIKES LOW PROFILE.
Chemical Week, Vol. 122, No. 26, p 37, June 28, 1978.

Descriptors: *Waste water treatment, *Pulp wastes, *Treatment facilities, *Maine, *Kraft mills, Pulp and paper industry, Water pollution treatment, Water pollution sources, Waste treatment, Wastes, Industrial wastes, Activated sludge, Aerated lagoons, Recovery furnace, Chemical recovery, Spill collection, Odor control, Burning, Boilers, Lime kilns.

The $35,000,000 environmental control system at the 800-ton/day kraft mill of Scott Paper Co. in Somerset, Maine includes a 25,000,000 gal/day activated-sludge treatment system that features two 8-acre aeration ponds, a recovery furnace equipped with a Koppers electrostatic precipitator, and a complex spill-collection system that can store and recover concentrated wastes that may enter the plant's sewer system. All possible odor sources are hooded, and the gases are collected for burning in either a hog boiler or a lime kiln. (Swichtenberg-IPC)
W79-02102

THE OCCURRENCE AND REMOVAL OF NITROGEN IN SUBSURFACE AGRICULTURAL DRAINAGE FROM THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W79-02107

COMBINATION LIMESTONE-LIME NEUTRALIZATION OF FERROUS IRON ACID MINE DRAINAGE,
Industrial Environmental Research Lab., Cincinnati, OH.
R. C. Wilmoth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 169, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-002, January 1978. 60 p, 10 fig, 18 tab, 6 ref.

Descriptors: *Acid mine water *Acid base equilibrium, *Mine drainage, *Limestone, *Sludge treatment, Chemical reactions, Neutralization, Ferrous iron, West Virginia, Lime, Cost-benefit analysis, Calcium hydroxides.

Results of studies conducted to evaluate combination limestone-lime treatment of ferrous iron acid mine drainage (AMD) are presented. Treatment was by a two-step neutralization process, whereby rock-dust limestone was mixed with the influent AMD and then hydrated lime was added in a polishing reactor. Combination first-stage limestone and second stage lime treatment of the AMD resulted in better than 30% reduction in reagent usage cost as compared to single-stage hydrated lime treatment of the same AMD. An equal cost reduction (compared to single-stage lime treatment) when a two-stage hydrated lime process in which the AMD and the recycled sludge were mixed in the first reaction vessel and hydrated lime was added to the second reactor. In situations where sludge was not recycled no cost advantage appeared to exist. (Davison-IPA)
W79-02150

THE CHARACTERIZATION OF BACILLUS CAPABLE OF BLUE-GREEN BACTERICIDAL ACTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
R. L. Reim, M. S. Shane, and R. E. Cannon.
Canadian Journal of Microbiology, Vol. 20, p 981-986, March 18, 1974. 3 fig, 3 tab, 13 ref. OWRT A-016-DEL(6).

Descriptors: *Cyanophyta, *Bactericides, *Bacteria, Biocontrol, Oxidation ponds, Viruses, *Bacillus brevis, Antibacterial activity, *Lysogeny.

A gram-negative, aerobic, spore-forming Bacillus isolated from a sewage oxidation pond was found to have a lytic effect on a wide variety of blue-green bacteria and on several bacteria, including other bacilli. The isolate, designated 247, has been identified as an atypical Bacillus brevis. The lytic activity was found in the culture filtrate and was produced during the stationary phase of growth. When the culture filtrate was applied to the interaction between plectonema boryanum ad LPP-cyanophages, it facilitated the establishment of lysogeny by these viruses. (Heson - Delaware)
W79-02159

INVOLVEMENT OF FREE RADICALS IN THE AQUEOUS-PHASE CATALYTIC OXIDATION OF PHENOL OVER COPPER OXIDE,
Delaware Univ., Newark. Dept. of Chemical Engineering.

A. J. Sadana, and J. R. Katzer.
Journal of Catalysis, Vol 35, p 140-152, (1974). 7 fig, 47 ref. OWRT A-027-DEL(2).

Descriptors: Oxidation, Catalysts, Chemical reactions, Phenols, Kinetics, Industrial wastes, *Waste water treatment, Ultimate disposal, Chemical wastes, Free radicals, Catalytic oxidation, Aqueous-Phase oxidation.

Aqueous-phase of phenol over copper oxide was studied between 369-393 degrees K and 1-17 atm oxygen pressure in batchwise mode. The reaction involves an induction period and a steady-state activity regime. The initial rate is first order in phenol and oxygen, but the rate is one-half order in oxygen in the steady-state activity regime. Heterogeneously catalyzed aqueous-phase phenol oxidation occurs by a free-radical mechanism which involves initiation on the catalyst surface, homogeneous propagation and either predominantly homogeneous or heterogeneous termination depending on catalyst concentration. That a free-radical mechanism is involved is indicated by the induction period, by the observed reaction kinetics, by free-radical inhibitor studies which show the same inhibitor efficiencies as observed in free-radical oxidation and by pH studies. The involvement of a heterogeneous-homogeneous raction mechanism is indicated by dependence of the reaction rate on catalyst concentration.
W79-02166

BARK AS A MEDIUM FOR GRAVITY DEWATERING OF SECONDARY SLUDGE FROM PULP AND PAPER MILLS,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
G. R. Lightsey, and W. B. Hall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 699 Price codes: A03 in paper copy. Water Resources Research Institute, Mississippi State University, Report, October 1978. 28 p, 13 fig, 3 tab, 11 ref. OWRT A-117-MISS(1), 14-34-0001-8026.

Descriptors: *Secondary sludge dewatering, *Dual media filters, *Pulp and paper mill sludge, *Sludge dewatering, Suspended solids, Settleable solids, Biological wastes, Sludge treatment, *Bark filters, *Secondary sludge, Pulp and paper mills.

The objective was to evaluate the use of bark filters for gravity dewatering of secondary sludge from pulp and paper mills. Samples of secondary sludge were collected from various pulp and paper mills and passed through filtering beds containing both hogged and unhogged softwood barks. The characteristics of the sludges were measured both before and after gravity dewatering on the bark filters. Due to frequent clogging of flow control mechanism a declining flow rate mode was used. Significant reductions in settleable solids and in total solids were achieved only in filters containing bark that had passed through an 1/8 inch screen. Moderate reductions in settleable and total solids were found with filters containing bark passing 1/4 inch caught on 1/8 inch screen. Larger bark sizes have little filtering action. Bark filters, if blinding were reduced, could be used effectively to dewater secondary sludge.
W79-02186

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE, AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W79-02255

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
J. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 797, Price codes: A04 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center Technical Report No. 111. November 1978. 48 p, 3 fig, 18 tab, 20 ref, 3 append. OWRT C-6106 (No. 5213)(6).

Descriptors: *Urban drainage, *Drainage systems, *Detention reservoirs, *Cost analysis, Storm runoff, Storm drains, Urban hydrology, Surface drainage, Pipelines, Detention, Storage requirements, *Detention storage.

Economic comparisons are made of 15 urban drainage designs considering combinations of open channel, pipe, and detention storage. Emphasis was placed on detention storage in order to permit evaluation of the detention storage with relation to different scales of treatment plants. The systems were designed for a 1,912 acre watershed in West Lafayette, Indiana. Complete pipeline systems with no open channels that have detention storage were more costly than pipelines without detention storage. Detention storage is more costly than pipeline alone even when the storage is a low grass area in a recreational park rather than a concrete lined facility. A single large volume detention facility is less costly than multiple facilities. With very large volumes of detention storage the number of facilities has strong interaction with the location of the facility, hence the economically least expensive system is a joint function of size, number and location. (Wiersma-Purdue)
W79-02289

AN ECONOMIC APPROACH TO WATER SUPPLY PLANNING IN SOUTHEASTERN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. VA. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02294

INVESTIGATIONS OF HEAT TREATMENT FOR PAPER MILL SLUDGE CONDITIONING,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, MI. Central-Lake STates Regional Center.
For primary bibliographic entry see Field 5E.
W79-02296

WINERY WASTEWATER CHARACTERISTICS AND TREATMENT,
French (R. T.) Co., Shelley, ID.
K. L. Sirrine, P. H. Russell, Jr., and J. Makepeace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 932, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-77-102, June 1977. 76p, 24 fig, 8 tab, 5 ref, 1 append.

Descriptors: *Food processing industry, *Activated sludge, *Treatment facilities, *Pilot plants, *Nutrient requirements, Industrial wastes, Aerobic treatment, Tertiary treatment, Waste water treatment, Winery wastes, Grape processing.

The characteristics of winery waste water and methods of treatment were investigated at the Widmer Wine Cellars in Naples, New York. Design factors related to grape processing and effluent requirements are discussed. Since wine making includes a grape pressing phase and a processing phase, waste water characteristics are given for both seasons. An interceptor sewer and a waste water treatment facility which included an entrance structure, aeration units, a final clarifier, a tertiary sand filter, and an aerobic digester were constructed as part of the study. The facilities were used to study the effects of variable food-to-microorganism ratios, establish the reaction rate for winery waste water, and to examine nutrient and neutralization needs. Operation of the facility indicated that long-term activated sludge processes followed by tertiary sand filtration were capable of reducing influent BOD of 1370 mg/liter and solids concentrations of 182 mg/liter by 96%. Freezing temperatures during the winter hindered operations of the aeration basins, clarifier, and diverter boxes. Additions of nitrogen and phosphorus to provide a BOD:N:P ratio of 100:5:1 were required to insure proper sludge formation, treatment, and settling. Reaction rate constants determined by the study were 0.0066 at 20C for the pressing season and 0.022 at 20C for the processing season. Construction and operating costs are presented for the facility. (Schultz-FIRL)
W79-02297

CHARACTERIZATION AND IN-PLANT REDUCTION OF WASTEWATER FROM HOG SLAUGHTERING OPERATIONS,
Wisconsin Univ.-Madison.
P. M. Berthouex, D. L. Grothman, D. O. Dencker, and L. J. P. Scully.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 091, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/2-77-097, May 1977. 171 p, 38 fig, 27 tab, 3 ref, 5 append.

Descriptors: *Food processing industry, *Hogs, *Treatment facilities, *Water utilization, *Water conservation, Industrial wastes, Costs, On-site data collections, Organic wastes, Organic loading, Waste water treatment, Hog slaughtering wastes, Meat packing wastes.

The character and quantity of wastes generated in a typical hog slaughtering operation were examined at Oscar Mayer plants in Madison, Wisconsin; Beardstown, Illinois; and Davenport, Iowa. Hog slaughter and carcass handling operations at the facilities are described. Waste water characteristics presented for the production shift, cleanup shift, and total hog kill floor effluent include total solids, suspended solids, volatile solids fractions, COD, total Kjeldahl nitrogen, total organic carbon, BOD, and grease. Waste water collection and treatment systems at the three facilities are examined. Process modifications to reduce the waste water flow and pollution load are evaluated. Process changes in the stick and bleed area, the scald tank, the dehairing area, the rail polisher, the carcass shower, the carcass work-up area, the evisceration treadmill and viscera pans, the hasher-washer, the stomach washer, the neck washer, and the chitterling washer resulted in annual savings of up to $129,000 above the cost of the modification. A strategy for in-plant studies to reduce waste water production is presented. (Schulz-FIRL)
W79-02298

OZONE TREATMENT OF CYANIDE-BEARING PLATING WASTE,
PCI Ozone Corp., West Caldwell, NJ.
L. J. Bollyky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 015, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-104, June 1977. 51 p, 2 fig, 17 tab, 21 ref.

Descriptors: *Ozone, *Cyanide, *Electronic equipment, *Separation techniques, *Oxidation, Pilot plants, Chemical wastes, Industrial wastes, Metals, Copper, Gold, Silver, Waste water treatment, Electroplating wastes.

A study was conducted to evaluate the use of ozone to treat cyanide wastes from electroplating processes as an alternative to conventional chemical treatment methods. Full-scale studies were conducted in Wichita, Kansas, at Sealectro Corporation, an electronics manufacturing plant which uses copper, gold, and silver plating in its operations. Acidic metal wastes and alkaline cyanide waste streams are collected separately and can be stored in underground equalization tanks. The treatment system also includes a PCI Model G-20-M Ozone Generator, a pH control system, an ozone reactor, a caustic tank, a flash mixer, and a settling tank. Studies on the effects of changes in process parameters indicated that the optimum process parameters for the Sealectro plating waste treatment plant were an ozone dosage of 1-1.5 mole O3/mole CN(-) or 1.85-2.8 mg/liter O3 per mg/liter; a pH of 7.5-9.5 for the cyanide waste; a pH of 9.0-9.5 for the final treated effluent in the settling tank; and ambient temperatures of 14-20 C. Cyanides and cyanates were destroyed by oxidation, and copper and silver were removed as oxides during the

treatment process. Capital costs for the system were $66,613 in 1973 and operating costs were $55.50/day. Treatment costs were $29.88/day for total CN removal with a total treatment cost of $73.26/day. (See also W77-08638) (Schulz-FIRL)
W79-02299

NEW MEMBRANES FOR TREATING METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS,
Midwest Research Inst., Minneapolis, MN.
R. J. Peterson, and K. E. Cobian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 363, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-197, October 1976. 69 p, 15 fig, 13 tab, 23 ref, 3 append.

Descriptors: *Membrane processes, *Reverse osmosis, *Copper, *Zinc, *Polymers, Filtration, Metals, Industrial wastes, Acidic water, Waste water treatment, Design data, Electroplating wastes, Cyanides, Membrane performance.

The NS-100 membrane, consisting of a polyurea layer created by the reaction of tolyene diisocyanate with polyethylenimine and deposited on a porous polysulfone support film, was evaluated for use in reverse osmosis treatment of electroplating wastes. Objectives of the program include the modification of the fabrication process for NS-100 tubular reverse osmosis membranes for optimum performance with metal finishing wastes, the demonstration of long-term usage of NS-100 membranes with acid and alkaline rinse waters, and the design of a field demonstration unit. Fabrication procedures for the polymers and the tube cast membranes are presented. Design data and testing procedures for the pilot-scale reverse osmosis test loop used in the evaluation are presented. Tests included 2360 hours of continuous operation with 1.27-cm tubular membranes, half at pH 1.2 (acid copper) and half at pH 12.8 (zinc cyanide). Membrane rejections were greater than 99% for copper and zinc, and greater than 96% for cyanide. Membrane fluxes for the acid copper solution were 18-24 liters/sq m/hr but only 8-15 liters/sq m/hr for the zinc cyanide solution. Two experimental membranes produced with isophthaloyl chloride instead of tolyene diisocyanate performed well with zinc rejections of 98.5% but only exhibited cyanide rejections of 90%. Reproducibility of the procedure for tubular NS-100 membranes was inadequate, since membranes which were fabricated at the beginning of the study had high permeate fluxes while membranes produced later had low fluxes and high salt rejections. (Schulz-FIRL)
W79-02300

TREATMENT OF HIGH STRENGTH MEATPACKING PLANT WASTEWATER BY LAND APPLICATION,
Texas Univ. at Paso. Dept. of Civil Engineering.
A. J. Tarquin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 582, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/2-76-302, December 1976. 49 p, 11 fig, 6 tab, 14 ref.

Descriptors: *Food processing industry, *Return flow, *Nutrient removal, *Irrigation practices, Grasses, Waste water disposal, Nitrogen, Chemical oxygen demand, Infiltration, Fescues, Organic loading, Industrial wastes, Waste water treatment, *Meatpacking wastes.

The treatment of high-strength meatpacking plant waste water by land application was investigated in pilot studies at the Peyton slaughterhouse/meatpacking plant in El Paso, Texas. Laboratory studies were conducted to examine the plant's waste water characteristics and to determine the most appropriate type of soil cover for planting in the application areas. Overland flow systems and infiltration with high-pressure and low-pressure systems at various hydraulic and organic loading rates were the two types of land application considered. Design data for the application systems are presented. Once growth was established with regular irrigation, two warm season grasses (Bermuda NK-37 and Blue Panicum) and two cool season grasses (Kentucky-31 Tall Fescue and Jose Wheatgrass) were irrigated with the meatpacking plant waste water. Studies with the infiltration systems indicated that raw waste water COD of 9400 mg/liter could be reduced by 99% at an application rate of 10 cm/week. COD removal by the overland flow system was 84% and improved with 'aging' of the application site. Nitrogen removal by the infiltration system was 72% at an application rate of 6.3 cm/week and 58% at 10 cm/week. Nitrogen removal by overland flow treatment was 44%. Aerosol drift was lower with the low-pressure infiltration system than with the high-pressure system. Further studies on waste segregation, nitrogen removal, hazards posed by pathogenic bacteria, and full-scale land application of meatpacking plant waste waters are recommended. (Schulz-FIRL)
W79-02301

LIMESTONE AND LIME NEUTRALIZATION OF FERROUS IRON ACID MINE DRAINAGE,
Environmental Protection Agency, Rivesville, WV. Resource Extraction and Handling Div.
R. C. Wilmoth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 911, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-101, May 1977. 105 p, 22 fig, 34 tab, 19 ref.

Descriptors: *Mine drainage, *Acid mine water, *Neutralization, *Limestones, *Lime, Pilot plants, Treatment facilities, Cost comparisons, Hydrogen ion concentration, Industrial wastes, Waste water treatment.

Results of a two-year study on the treatment of ferrous-iron-containing acid mine drainage with hydrate lime and rock-dust limestone neutralization are presented. The EPA neutralization facility at the Crown Mine Drainage Control Field Site near Morgantown, West Virginia, contained two parallel treatment trains in which acid mine drainage could be cycled from the turbine flow meter into: (1) a lime reactor, an aerator, and a thickener; (2) a limestone reactor, an aerator, and a thickener; or (3) a limestone reactor, a lime reactor, an aerator, and a thickener. Limestone neutralization was investigated as an alternative to lime treatment because of its cheaper costs and low-volume, high-density sludge. With limestone treatment, most effective neutralization was at a 20% sludge recycle rate, a pH value near 7, a 30-min detention time with vigorous mixing in the reactor, 4-6 hours detention in the aeration system, and the addition of coagulants at a 7 mg/liter rate. Lime treatment involved a 7-min reaction time, less than a 2-hr oxidation time, and a coagulant addition of 5 mg/liter. Although the limestone process was effective under certain conditions, the process was considered infeasible for general application to acid mine water containing more than 50 mg/liter of ferrous iron. (Schulz-FIRL)
W79-02302

HANDLING AND DISPOSAL OF SLUDGES FROM COMBINED SEWER OVERFLOW TREATMENT. PHASE II - IMPACT ASSESSMENT,
Envirex, Inc., Milwaukee, WI. Environmental Sciences Div.
K. R. Huibregtse, G. R. Morris, A. Geinopolos, and M. J. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 309, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-77-0536, December 1977. 197 p, 53 tab, 30 fig. 68-03-0242.

Descriptors: *Sewage disposal, *Sewage treatment, *Combined sewers, *Overflow, Estimated costs, Dewatering, Waste water treatment, Storm water, *Sludge disposal, *Water quality standards, Biochemical oxygen demand, Biological treatment processes, Precipitation, Organic loading, Dry weather plant sludge, Gravity thickening, Lime stabilization.

Increasing urbanization, economic expansion and water demands are contributing to the combined sewer overflow problem in the U.S. More than 1300 U.S. communities serving 36.2 million people have combined sewer systems which provide one collection system for both sanitary sewage and stormwater runoff. The discharge of these overflows during and after heavy rains is an important source of water pollution. The objective of this report is to attempt a rough quantification of the effort the U.S. will have to exert in the future, in the area of sludge handling and disposal, if full-scale treatment of combined sewer overflows (CSO) is to become a reality. Assuming an equal mix of various waste water treatment methods, an average yearly sludge volume resulting from treatment of all CSO nationwide would amount to 156.8x10 to the sixth power cu m (41.45x 10 to the ninth power gal) or 2.8% of total volume treated. Preliminary economic evaluation indicated that possible grit removing, lime stabilization, storage, gravity thickening, and land application or land fill were the most cost-effective treatment systems. Costs for overall CSO sludge handling would be dependent on the type of CSO treatment process and other considerations. Estimates indicate that initial capital costs would range from $447-10,173/ha ($181-4129/ac) with annual costs of $139-1630/ha ($56-660/ac). (See also W78-05987) (Coan-NC)
W79-02303

METHOD AND APPARATUS FOR REMOVING GRIT,
Ecodyne Corp., Lincolnshire, IL. (Assignee).
F. G. Weis
U.S. Patent No. 4,107,038, 5 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1246, August 15, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Separation techniques, Settling basins, Flow, Flow characteristics, Flow around objects, Suspended solids.

Grit is removed from liquid sewage by flowing such sewage into a settling chamber and causing the sewage to flow in a toroidal pattern around the periphery of the chamber. Grit falls to the floor of the settling chamber and passes radially to and then through a central opening into a grit collection chamber. Organic solids are kept in motion in the toroidal flow pattern, or lifted from the settling chamber floor and are discharged through an outlet adjacent the upper surface of the liquid in the settling chamber. Toroidal flow is created and maintained by obstructing the tangential flow path of incoming sewage with a baffle which blocks the inlet and has an edge extending above the upper surface of the liquid. A propeller rotating about a vertical axis in the center of the chamber is adjustable so as to keep the contents of the chamber impinging against the baffle as they flow around the tank in the toroidal pattern. (Sinha-OEIS)
W79-02305

METHOD OF AND APPARATUS FOR PURIFYING FLUIDS WITH RADIOACTIVE IMPURITIES,
Epicor, Inc., Linden, NJ. (Assignee).
J. A. Levendusky
U.S. Patent No. 4,107,044, 7 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1249, August 15, 1978.

Descriptors: *Patents, *Waste water treatment, *Radioactive wastes, Water pollution treatment, Ion exchange, Filtration, Demineralization, Separation techniques.

An apparatus for the purification of water containing radioactive impurities is provided wherein the necessity for the handling of spent demineralization materials and filter elements is eliminated and the apparatus is disposable after the filter element and demineralization materials are exhausted. The apparatus includes a vessel having inlet and outlet structure and provision for filtration of undissolved solids and ion exchange removal of dissolved solids. The vessel is encased in a radiation impervi-

ous material and the method contemplates utilization of filtration materials and ion exchange materials substantial to exhaustion thereafter to dispose of the entire structure. (Sinha-OEIS)
W79-02307

CONTINUOUS TREATMENT OF LIQUID EFFLUENT AND SEWAGE,
Imperial Chemical Industries Ltd., London (England) (Assignee).
G. F. G. Clough.
U.S. Patent No. 4,108,763, 5 p, 4 fig, 3 ref; Official Gazette of the United STates Patent Office, Vol 973, No 4, p 1818, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Sewage treatment, Industrial wastes, Oxygenation, Compressible flow, Aerobic conditions, Equipment, Decompression.

A method and apparatus for the treatment of liquid-borne sewage or effluent is described in which the liquid is circulated first through a tubular coil or a compression coil which is rotating about a vertical axis. The pressure exerted on the liquid increases continuously as the liquid passes from the innermost end of the coil to the outermost end of the coil. Next the liquid is circulated through a tubular coil or decompression coil which is rotating about a vertical axis. The pressure exerted on the liquid decreases continuously as it passes from the outermost end of the coil to the innermost end of the coil. An oxygen-containing gas is supplied to the liquid as it passes through the compression coil. When the liquid is compressed there is a reduction in the size of the oxygen-containing gas bubbles and dissolution of gas. This achieves an efficient transfer of oxygen and the aerobic process takes place efficiently. When the liquid enters the rotating decompression coil, the bubbles reappear and gradually increase in size and aid the circulation of the liquid. (Sinha-OEIS)
W79-02310

SEPARATION OF AN AQUEOUS OR WATER-MISCIBLE LIQUID FROM A FLUID MIXTURE,
Georgia-Pacific Corp., Portland, OR. (Assignee).
W. D. Cooper.
U.S. Patent No. 4,108,767, 5 p, 12 ref; Official Gazette of the United States Patent Office, Vol 973, No 4, p 1819, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Industrial wastes, Chemical wastes, Separation techniques, Magnetic fields, Ferromagnetic iron compositions.

In many chemical processes, streams or products of water-immiscible organic liquids are obtained in which water is dispersed to various extents. Only partial separation of the water from the organic liquid may be obtained by settling, or centrifugation, and further processing is required. Therefore, a process is provided for the separation from a liquid of water of a water-miscible liquid dispersed in the fluid by use of a magnet or a magnetic field. A water soluble ferromagnetic composition selected from the group consisting of ferromagnetic iron lignosulfonates, ferromagnetic iron sulfonated tannins, and ferromagnetic iron compositions of a sulfonated phenol condensed with an aldehyde is added to the fluid containing the dispersed water. The water-soluble ferromagnetic composition is intermixed with the fluid mixture which is then subjected to a magnetic field resulting in the mixture being attracted and thus separated. (Sinha-OEIS)
W79-02311

METHOD OF CLARIFYING INDUSTRIAL WASTE WATER,
Winchester Chemical Co., Franklin Park, IL. (Assignee).
J. V. Sebelik, and W. Schaefer.
U.S. Patent No. 4,108,768, 6 p, 2 fig, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 4, p 1819, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, Industrial wastes, Flocculation, Separation techniques, Laundering.

An industrial waste water containing hexane soluble impurities is adjusted in pH to a value of a least 11.6 and thereafter calcium chloride is added to that waste water in an amount of at least 1,700 parts per million, based on the total weight of industrial waste water. A metal hydroxide floc results which includes a substantial portion of the hexane soluble impurities attached to or incorporated in the floc. The floc can be agglomerated with conventional coagulants and then separated from the clarified waste water. The calcium chloride will react at this very high pH to effectively flocculate a substantial portion of the oils and greases (hexane solubles) in addition to a substantial portion of the contaminating metal ions in the industrial waste water. (Sinha-OEIS)
W79-02312

PROCESS FOR REDUCING THE MERCURY CONTENT OF INDUSTRIAL WASTE WATERS,
Hoeschst A. G., Frankfurt am-Main (West Germany). (Assignee).
M. Krieg, and T. Olffers.
U.S. Patent No. 4,108,769, 6 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No. 4, p 1819-1820, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, *Mercury, Ion exchange, Chemical reactions, Chemical precipitation, Separation techniques, Filtration.

The invention deals with the reduction of the mercury content of industrial waste waters, especially those from a chlorine-alkali electrolysis using the amalgam process. All mercury present in the waste water is converted to the form of Hg^{++} ions by adding chlorine. Subsequently Fe^{++} ions are added. The pH of the solution is raised until a redox potential of from -0.1 to -0.8 volts, relative to the normal hydrogen electrode, is obtained. The mercury precipitated and the iron oxide hydrate formed may be filtered from the waste water. Residual mercury contents in the filtrate of about 50 mg/cu m may be obtained. (Sinha-OEIS)
W79-02313

METHOD FOR TREATING A MEDIUM CONTAINING WATER WITH COAGULANTS,
W. Vogel.
U.S. Patent No. 4,110,209, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2309, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Water purification, Water pollution treatment, *Coagulation, Flocculation, Mixing, Chemical precipitation, Separation techniques.

A method for increasing the chemical efficiency of precipitating agents having a metal base in the treatment of water, waste water or sludge is described. The medium to be treated is initially conducted by pressure into a mixing cell where it is mixed in free turbulence with a precipitant solution and caused to react to form a reaction mixture containing flocs. The reaction mixture is conducted into a separating basin in which the flocs are removed from the clear water. (Sinha-OEIS)
W79-02322

PROCESS FOR THE PREPARATION OF A SUBSTANTIALLY HOMOGENEOUS LIME WATER SOLUTION,
S. A. Henrikson.
U.S. Patent No. 4,110,211, 6 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 973, No. 5, p 2310, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, Separation techniques, Flocculation, Lime, Equipment.

In the preparation of homogeneous lime water solution for use in the purification of waste water, a lime water suspension is used as starting material. The lime water suspension is supplied at the bottom of a compartment where it is caused to rise. It passes lamellas (baffles) during its upward movement. The lamellas are arranged in such a way that they create a sludge zone in the lower part of the compartment where the rising lime suspension is filtered. The lamellas create a clarification zone at the upper part of the compartment where the fine particles are separated. (Sinha-OEIS)
W79-02323

METHOD OF TREATING A WASTE LIQUID CONTAINING POLLUTING COMPOUNDS,
D. Krofchak.
U.S. Patent No. 4,110,212, 5 p, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2310, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Chemical reactions, Waste disposal, Solid wastes, Hydrogen ion concentration, Landfills, *Chemical precipitation, Inert precipitates.

Waste water containing polluting compounds is mixed with an acidic ferrous salt solution to adjust the pH of the liquid to a value within the range of from about 2 to about 5 and to reduce polluting compounds in the waste water to a form capable of reacting with an alkali to produce a precipitate. The adjusted waste water is then reacted with an alkali to raise the pH of the liquid to a value within the range of from about 9 to about 12.5 and to produce the precipitate. The alkaline waste water is then reacted with a silicic compound to form large complex silicate molecules with the precipitate and consequent solidification of the waste water into a stable, non-polluting solid, which may be used as land fill or road foundations. (Sinha-OEIS)
W79-02324

DRAINAGE DEVICE FOR PARTICULATE MATERIAL,
South African Block and Concrete (Pty) Ltd., Alberton. (Assignee).
J. B. Pfeffer.
U.S. Patent No. 4,110,214, 8 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2311, August 29, 1978.

Descriptors: *Patents, Water pollution treatment, *Waste water treatment, *Suspended solids, Separation techniques, Solid wastes, Equipment, *Drainage devices.

A drainage device comprising a bucket wheel has circumferentially spaced foraminuous buckets. In operation, when the bucket wheel rotates, the buckets in succession scoop out quantities of liquid having solids in suspension. The liquid drains away and the solids remain in the buckets and are later discharged before the buckets enter the liquid again. Rotation of the wheel about its axis takes place in arcuate steps by the operation of a pair of axially spaced plunger and cylinder assemblies engaging alternately in cyclic fashion with shoulders circumferentially spaced about the wheel axis. The number of steps per revolution may lie within the range of ten to forty inclusive. (Sinha-OEIS)
W79-02326

LIQUID LEVEL CONTROL SYSTEM FOR SEPARATION TANK,
Sun Oil Co., Philadelphia, PA. (Assignee).
D. A. Bramlett.
U.S. Patent No. 4,110,215, 7 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2311, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Industrial wastes, Sepa-

ration techniques, Flow control, Water level, *Weirs, Equipment.

Separation tanks are often used to separate pollutants from waste water discharges from industrial processes before the water is permitted to be discharged into a natural body of water. One aspect of the separation tank operation which relates to its efficiency for controlling the quality of the effluent water is the maintenance of the liquid level within the tank within predetermined tolerances. This inventions provides a automatic liquid level controller for a separation tank. The automatic liquid level control system includes an external stilling well mounted on the side of the separation tank and having a liquid level sensing means which produces a pneumatic signal to the liquid level. A pneumatic operator receives the pneumatic signal and maintains the proper position of the weir gate in the weir or outfall box of the separation tank, so that the amount of effluent water flowing from the tank is appropriately regulated to maintain the desired liquid level in the tank. (Sinha-OEIS)
W79-02327

POLYQUATERNARY COMPOUNDS FOR THE CONTROL OF MICROBIOLOGICAL GROWTH,
Chemed Corp., Cincinnati, OH. (Assignee).
S. A. Shair, S. N. Paul, and J. E. Cairns.
U.S. Patent No. 4,111,679, 4 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 974, no 1 P 293 September 5, 1978.

Descriptors: *Patents, *Industrial water, *Waste water treatment, Water quality control, Organic compounds, Microorganism, Slime, Bacteria, Fungi, Algae, Polyquaternary amines.

The method for controlling microorganisms in industrial cooling water systems comprises adding to the system a microbiocidal amount of a polyquaternary amine. The polyquaternary amines appear to be effective in controlling a broad range of bacteria, fungi, and algae, over a wide pH range, and at low dosages. The invention is of particulr value in slime control in industrial applications, such as air conditioning units, cooling water systems, etc. (Sinha - OEIS)
W79-02331

FILRATION SYSTEM,
Canplan Filtration Ltd., Halifax (Nova Scotia).
J. Jay, G. D. Bonner, and O. J. Betancourt.
U.S Patent No. 4,111,801, 12 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 328-329, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Waste water treatment, Water pollution treatment, Industrial wastes, *Filtration, Water quality control, *Bilge water, Oil recovery, Plastic foam.

Methods and apparatus for filtering liquids such as oil contaminated water includes spaced apart supply and take-up reels capable of storing an elongated compressed ribbon of flexible open cell foam. In operation the ribbon of filtering medium, in the uncompressed state, extends between the reels across a support such as a grid or screen which permits free flow of water through the filter medium. The contaminated water is supplied to the upper side of the filter medium through a system which evenly distributes the contaminated water. The water passing through the filter medium may be collected in a suitable tank or basin. When the exposed section of filter medium becomes so loaded with contaminants (such as oil) that the flow through the filter decreases, the ribbion is advanced to expose a fresh sectin. Means are provided for compressing the contaminated ribbon to extract the oil before it is wound up on the take-up reel. The recovered oil is directed to a receptacle. Both the supply and take-up reel are provided with compression means which assist in compressing the ribbon of filter thereby contributing greatly to the compactness of the overall system. (Sinha-OEIS)
W79-02332

PROCESS FOR RECOVERING PROTEINACEOUS MATTER FROM ACID WHEY AND TANNERY UNHAIRING EFFLUENTS,
Department of Agriculture, Washington, DC. Office of the Secretary. (Assignee).
R. E. Townend.
U.S. Patent No. 4,111,803, 3 p, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 974, no 1, p 329, September 5, 1978

Descriptors: *Patents, *Water pollution, *Industrial wastes, Separation techniques, Chemical wastes, Tannery wastes, Dairy industry, Proteins, Amino acids.

Tannery unhairing waste and acid whey are mixed in proportions containing from 20 to 40% by volune of the tannery waste to spontaneously precipitate proteinaceous matter from both waste effluents and leave a relatively clean supernatant liquid. When the mixture is warmed to about 70C, all macromolecular components are quatitatively precipitated. (Sinha - OEIS)
W79-02334

GRAVITATIONAL SEPARATOR FOR MIXTURES OF IMMISCIBLE LIQUIDS OF DIFFERENT DENSITIES,
National Marine Service, Inc., St. Louis, MO. (Assignee).
D. A. Wright, and C. H. Walters
U.S. Patent No. 4,111,806, 9 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 330, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Waste water treatment, Separation techniques, Equipment, Density, Coalescence, Bilge water, Gravity separation, Backflushing.

An improved gravitational separator for mixtures of immiscible liquids of different densities, particularly oil and water, includes a reaction member in the form of a dome or diaphragm immersed in more dense liquid to be separated and which floats upwardly under the influence of liquid of less density accumulated beneath the dome or diaphragm. A coalescer screen filter system is provided in the water outlet path in the separator, the coalescer screens being contained in a chamber provided with automatically operating, one-way, pressure responsive valves to ensure proper flow of water in a forward and backflush sense through the chamber. A flotation feature for the reaction member is provided, and the reaction member includes an auxiliary air chamber to prevent loss of a minimum desired residual layer of less dense fluid beneath the reaction member when air accumulates in this area. A specific inflow and outflow conduit arrangement is provided to carry backflushed oil from the coalescer to the inlet conduit of the separator. (Sinha-OEIS)
W79-02336

DESALINATION REVERSE OSMOTIC MEMBRANES AND THEIR PREPARATION,
Shinetsu Chemical Co., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W79-02338

SCANNING APPARATUS FOR SEPTIC EFFLUENTS,
Environmental Devices Corp., Marion, MA. (Assignee).
W. B. Kerfoot, and E. C. Brainard, II.
U.S. Patent No. 4,112,741, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 643, September 12, 1978.

Descriptors: *Patents, *Water pollution, *Monitoring, Measurement, Sampling, Instrumentation, Subsurface waters, Subsurface drainage, Water quality control, Effluents.

A continuously operative sample intake is traversed along the shoreline at a preselected subsurface level appropriate for picking up effluents emanating from on-shore septic systems. The conductivity and the fluorescence of the sampled water are measured continuously, the wavelength of the fluorescence measured being chosen to determine the presence of aromatic hydrocarbons and detergent whiteners which are present in distinctive proportions in recharged septic effluents. Signal processing means are incorporated for generating an output signal which varies as a function of the conjoint deviation of the two measurements from the values which are representative of background levels. (Sinha-OEIS)
W79-02340

WASTE WATER RECLAMATION APPARATUS,
J. B. Lajeuness.
U.S. Patent No. 4,112,972, 4 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 722, September 12, 1978.

Descriptors: *Patents, *Waste water(Pollution), *Water reuse, Water utilization, Irrigation water, Reclaimed water, Impaired water use, Equipment, Valves

The object of this invention is to collect waste water from selected sources and distribute it to selected outlets. A conduit arrangement is provided which is coupled to selected sources of waste water whereby the water is collected into a storage container and held in the container pending demand distribution of the waste water into selected outlets such as for lawn and plant irrigation purposes. Means are provided for gravity flow of the waste water through the system and a diverter valve is included for separating 'gray' water from the conventional black water sewer system. This one-piece device also maintains proper sewer functioning in its open position by allowing atmospheric pressure to reach downstream backflow from reaching the diversion. In the open position, it is 100% efficient with normal flow, with peak flow it has an efficiency of about 90%. In the closed position, it maintains the original drain and sewer function. (Sinha-OEIS)
W79-02341

GREASE SEPARATOR,
F. P. Bereskin, and J. J. Borowczyk.
U.S. Patent No. 4,113,617, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 934, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Separation techniques, Cooling, Equipment, *Grease traps, F.O.G.(Fats oils, greases).

A grease separating system includes four successive chambers. The heated, emulsified grease is passed through a solids retention box into an inlet chamber where cool water is sprayed onto the emulsified grease. This mixture is passed through a connecting chamber, and then over baffles at the entrance of a collection chamber. The grease having been separated from its emulsified state rises to the top of the mixture in the collection chamber, and the water passes into a discharge chamber and in to the connected sewer system. After successive operations, the floating grease is sensed when it reaches a predetermined level, and an alarm is sounded to indicate that the accumulated grease should be removed. (Sinha-OEIS)
W79-02342

WASTE FLUID TREATMENT SYSTEM,
Arrington Co., Inc., Muskego, WI. (Assignee.
J. R. Arrington.
U.S. Patent No. 4,113,619, 6 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 935, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, *Chemical reactions, Mixing, Safety, Equipment, *Cyanides, *Metal plating industry

A system for chemically treating waste water includes a storage tank, a recreation tank, and a

pump for transferring the waste water from the storage tank to the reaction tank. Conduits connecting the pump to the tank and control valves controlling the flow through the conduits are arranged so that, by coordinated actuation of the valves, the pump recirculates the waste water through the reaction tank to provide intermixing of the treatment chemicals and discharges the waste water from the reaction tank after treatment. The chemical reagents are introduced into the system on the suction of the pump so that gravity feed or separate pumping means is not required for the reagents. The tanks are preferably circular and mounted in a spaced relationship on a common base. Equipment for controlling the operation of the pump, the control valves, and the addition of the reagents are carried on a control panel. (Sinha-DEIS)
W79-02343

PLANNING AND STARTUP OF A FLEXIBLE ACTIVATED SLUDGE INSTALLATION (BIO-FLEX PROCESS) AS A BIOLOGICAL CLARIFICATION STAGE IN A BOARD MILL (PLANUNG UND INBETRIEBNAHME EINER FLEXIBLEN BELEBTSCHLAMMANLAGE (BIO-FLEX-VERFAHREN) ALS BIOLOGISCHE KLAERSTUFE EINER KARTONFABRIK),
Kartonfabrik Buchmann GmbH., Rinnthal (West Germany).
G. Renz.
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 20, p 359-362, May 31, 1978. 5 fig, 1 illus, 3 ref, 3 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Pulp wastes, *Board mills, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Water polluton sources, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Costs, Pulp and paper industry, Planning, Treatment facilities, Operation and maintenance, Water purification, Water pollution control.

Adding a biological clarification stage to an existing installation requires the establishment of a favorable ratio of water volume to concentration of impurities. As the water cycle approaches closure, the impurity concentration rises but the daily load is somewhat reduced. Using a modified activated sludge unit, satisfactory BOD and reduced COD were obtained. Advantages of this installation are a reliable operation at various pollution loads, properties of the activated sludge, and the low sludge index. The cost of the installation is low compared to figures given in the literature. (Ward-PC)
W79-02361

SCREENING -- A NOVEL APPROACH TO PRIMARY TREATMENT,
Combustion Engineering Inc., Brantford (Ontario). C-E Bauer Div.
J. G. Phillips.
Water and Pollution Control, Vol. 116, No. 5, p 44-45, May/June, 1978. 3 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Screens, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Costs, Economics, Effluents.

The use of static screens for primary effluent treatment is increasing, because they are inexpensive to install and operate and require limited floor space. The C-E Bauer Hydrasieve screen is one type of vertically mounted static screen that is available for the removal of solids. Although this screen was designed to thicken slurries in the pulp and paper industries, it has become widely accepted in the handling of various industrial waste waters. The screen is a pretreatment or primary treatment device, removing solid matter to create an effluent more readily treatable with existing equipment. A hydrasieve screen can be installed for approximately 25-35% of the cost of a primary clarifier. (Louden-IPC)
W79-02363

OPERATION OF THE (EFFLUENT) PURIFICATION EQUIPMENT AT THE RAZLOG PULP AND PAPER MILL (OPIT OT RABOTA NA PRECHISVATELNATA STANTSIYA KEM KTSKH RAZLOG),
L. Torbin, K. Stoichkov, and V. Tumbeva.
Tseluloza i Khartiya, Vol. 8, No. 6, p 24-26, 1977. 1 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Operation and maintenance, *Treatment facilities, Wastes, Industrial wastes, Waster treatment, Water pollution treatment, Water pollution sources, Foreign countries, Activated sludge, Pulp and paper industry, Effluents, Biological treatment, Biochemical oxygen demand, Sludge, Oxidation, Municipal wastes, Soviet Union(USSR).

The effluents of the Razlog pulp and paper mill (USSR) are treated jointly with the town's sewage by the activated sludge process. The treatment plant includes a mechanical purification line for the sewage, a mechanical purification line for the mill effluents (spent liquors and fiber-containing effluents), a blending tank where the two are mixed, and a biological purification line. According to specifications, a BOD reduction of 15% should occur in an aerated 7,560 cu m capacity blending tank. In practice, the BOD reduction was only 12%. In an attempt to improve the biological oxidation in the system, activated sludge was added to the blending tank to give a concentration of 150-200 mg/liter. The results of this modification were: a prolongation of the contact time of the sludge with the effluents; an increase of BOD reduction in the blender from 12 to 34%; and a reduction of the BOD load in the aeration tanks. Presently, the biological oxidation process has become a two-stage process, the blending tank operating as a mixer and aeration tank. (Stapinski-IPC)
W79-02367

POSSIBILITIES AND MEASURES IN THE PULP INDUSTRY IN THE INTEREST OF ENVIRONMENTAL PROTECTION (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES).
For primary bibliographic entry see Field 5G.
W79-02369

PULP INDUSTRY AND WATER POLLUTION CONTROL (ZELLSTOFFINDUSTRIE UND GEWAESSERSCHUTZ),
For primary bibliographic entry see Field 5G.
W79-02370

USE OF THE ACTIVATED SLUDGE PROCESS IN PURIFYING WASTE WATERS FROM PULP PRODUCTION, ESPECIALLY KRAFT PULP PRODUCTION (ANWENDUNG DES BELEBTSCHLAMMVERFAHRENS ZUR REINIGUNG VON ABWAESSERN AUS DER ZELLSTOFFPRODUKTION, INSBESONDERE DER SULFATZELLSTOFFPRODUKTION),
J. Nowacki.
Technik und Umweltschutz, Vol. 13, p 168-175, 1976. 17 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Waste treatment, Pulp and paper industry, Effluents, Sulfite liquors, Biological treatment, Color, Biochemical oxygen demand, Chemical oxygen demand, United States, Foreign countries, Europe, Treatment facilities, Poland, Kraft mills.

Following brief descriptions of five United States and three Polish pulp mill effluent treatment installations, the composition of waste waters from sulfite and sulfate (kraft) pulping are compared. Also discussed are the advantages and disadvantages of biological purification of pulp mill effluents and the use of semitechnical studies as a basis for the selection of treatment plant parameters. The activated sludge process is the main process used in treating kraft mill effluents, being superior to other known processes with respect to purification capacity and economy. However, this process is not particularly effective in reducing color. Typical data for an activated sludge plant include a 5-day BOD reduction of 86.9%, a COD reduction of 51.4%, and a color reduction of 20.0%. (Speckhard-IPC)
W79-02371

PURIFICATION OF EFFLUENTS OF THE VERKHOTURSK WOOD CHEMICAL PLANT IN STORAGE PONDS (OCHISTKA STOCHNYKH VOD VERKHOTURSKOGO LESOKHIMICHESKOGO ZAVODA V PRUDU-NAKOPITELE),
N. P. Drozdov, Z. K. Kuptsova, V. E. Zyuzyun, and N. A. Boiko.
Sbornik Trudov, Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Institut Lesokhimicheskoi Promyshlennosti, No. 24, p 141-146, 1975. 1 fig, 4 ref. 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Waste treatment, Biochemical oxygen demand, Chemical oxygen demand, Neutralization, Nutrients, Hydrogen ion concentration, Effluents, Soviet Union(USSR)

At the Verkhotursk wood chemical plant (USSR) the effluents are discharged jointly with sewage into two storage ponds (75 cu m capacity each). A study was made to determine the degree of biological purification occurring in these nonaerated ponds. Preliminary laboratory experiments indicated substantial reductions of BOD and COD if the effluent is neutralized (to pH 7.4-7.6) and nutrients are added. Such a treatment was applied to the effluents prior to discharge into the ponds, and samples were analyzed over a period of two summer months. The BOD and COD reductions during this period were 72 and 68.6%, respectively. (Stapinski-IPC)
W79-02372

PROCESSING OF PULP AND PAPER INDUSTRY WASTE BY REVERSE OSMOSIS FOR POLLUTION CONTROL,
N. V. Desai, A. V. Rao, and D. J. Mehta.
Salt Research and Industry, Vol. 12, No. 2, p 24-25, 1976.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Foreign countries, Membrane processes, Separation techniques, Membranes, Suspended solids, Chlorides, Sulfates, Chemical oxygen demand, Biochemical oxygen demand, Hydrogen ion concentration, Color, Dissolved solids, Pulp and paper industry, Effluents, Cellulose acetate.

Data are presented showing the characteristics of effluent from Central Pulp Mills Ltd. (India) before and after reverse osmosis through a cellulose acetate membrane at 600 psi. The permeate from the reverse osmosis plant contained 10 ppm color (Pt-Co unts), trace amounts of suspended solids, 180 ppm of dissolved solids, 49.7 ppm chloride and 4.12 ppm sulfate, and had a COD of 61.85 ppm, a BOD (5 days at 20C) of 10 ppm, and a pH of 7.8. The treated effluent can be discharged or reused in the manufacturing process. (Witt-IPC)
W79-02373

POSSIBILITIES FOR REDUCING COD AND 5-DAY BOD IN WASTE WATERS FROM THE PULP AND VISCOSE RAYON FIBER INDUSTRIES (MOEGLICHKEITEN ZUR REDUKTION DES CSB UND BSB(5) IN DEN ABWAESSERN DER ZELLSTOFF- UND VISKOSEFASERINDUSTRIE),
Chemiefaser Lenzing A. G., Lenzing (Austria)
P. Keppelmuller.
Muenchner Beitraege zur Abwasser-, Fischerei- und Flussbiologie, Vol. 28, p 63-80, 1977. 6 fig, 10 tab.

Descriptors: *Pulp and paper industry, *Rayon, *Water pollution control, *Chemical oxygen demand, *Biochemical oxygen demand, Foreign countries, Europe, Water pollution sources, Pulp wastes, Sulfite liquors, Effluents, Water pollution, Austria, Sulfite pulp mills.

Chemiefasern Lenzing AG. (Austria) produces 80,000-100,000 tons of rayon fiber/year and incorporates a sulfite pulp mill producing 100,000-110,000 tons/year. The integrated mill also includes a plant for manufacturing sulfuric acid as well as facilities for producing synthetic fibers, paper, plastic films, and lumber. The development of effluent treatment operations at the mill over the last 20 years is reviewed. Pollution control measures have included switching to magnesium-base sulfite pulping using the mill's own patented process. The biological degradability of bleaching effluents has been studied, but a satisfactory process for treating them has not yet been found. The present daily effluent load from the pulp mill amounts to 80,000 cu m, incorporating 45 tons of dissolved organic substance, 95 tons of COD, and 28-30 tons of 5-day BOD. Corresponding figures for the viscose rayon operation are 25,000 cu m, 20 tons COD, and 7.5 tons BOD. (Speckhard-IPC)
W79-02376

STATUS AND METHODS FOR EFFLUENT PURIFICATION IN PULP AND PAPER MILLS (STAND UND VERFAHREN DER RESTABWASSERREINIGUNG VON ZELLSTOFF- UND PAPIERFABRIKEN),
Techische Univ., Darmstadt (West Germany). Wasser und Abwasserforschungsstelle.
H. L. Dalpke.
Muenchner Beitraege zur Abwasser-, Fischerei- und Flussbiologie, Vol. 28, p 43,62, 1977. 15 fig, 11 ref, 17 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *West Germany, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Biological treatment, Effluents, Biochemical oxygen demand, Chemical oxygen demand, Economics, Research and development, Water pollution treatment, Foreign countries, Europe, Sewage treatment.

Data are reviewed concerning the pollution load of pulp and paper mill effluents in West Germany, and the development of effluent treatment measures is outlined. Emphasis is on mechanical and biological clarification of paper mill effluents. About one-fifth of the paper mill effluent in West Germany is presently being subjected to secondary biological clarification, the BOD load normally being reduced by more than 90% and the COD load by 70-90%. New clarification techniques (adsorption, oxidation, electroflotation, electrodialysis, electrolysis, chemical precipitation, reverse osmosis, ion-exchange, gamma-irradiation, evaporation, freezing) appear to be too expensive for use in processing paper mill effluents. (Speckhard-IPC)
W79-02377

PURIFICATION OF KRAFT PULPING EFFLUENTS BY ELECTROCHEMICAL OXIDATION (OCHISTKA STOKOV SUL'FATNO-TSELLYULOZNOGO PROIZVODSTVA ELEKTROKHIMICHESKIM OKISLENIEM),
Irkutskii Inst. of Orgaic Chemistry (USSR).
E. N. Serdobol'skii, M. I. Anisimova, and V. A. Babkin.
Khimiya Drevesiny, No. 1, p 41-46, January/February, 1978. 2 fig, 15 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Electrochemistry, *Oxidation, Water pollution treatment, Waste treatment, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Electrodes, Chemical oxygen demand, Color, Phenols, Lignins, Hydrogen ion concentration, Electric currents, Lead, Titanium, Graphite.

The electrochemical oxidative purification of kraft pulping effluents was investigated on effluents after biological purification but prior to chemical purification, on black liquor, on bleach plant effluents following the first alkali, extraction stage, and on condensates from evaporation units. Various materials (lead, titanium, graphite) were used as electrodes. Depending on the electrode material, on electroconductive additives, and on effluent composition, the purification achieved 65.5-87.0% reduction of COD, 40-99.5% removal of color, and 78-100% elimination of phenolic content. Lignins were completely removed from the effluents. Data on the effects of current density, pH, and electrode material on the degree of purification of the various effluents indicated that increasing current density up to 2-4 amp/sq dm sharply reduced the COD. The effect of pH was complicated, but the best pH using lead electrodes was 7-9. In spite of consuming a large amount of electrical energy, this method could become important for closed systems if electrical energy becomes cheaper. (Chern-IPC)
W79-02380

CHEMICAL FOAM CONTROL DURING EFFLUENT TREATMENT IN AERATION TANKS (KHIMICHESKOE PENOGASHENIE PRI OCHISTKE STOCHNYKH VOD V AEROTENKAKH),
Syavskii Leskokhimicheskii Zavod (USSR).
N. P. Drozdov, G. S. Kudryavtsev, N. G. Bondarchik, and P. S. Fokin.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No. 2, p 24-25, 1978. 4 ref, 2 tab.

Descriptors: *Aerated lagoons, *Waste water treatment, *Foam control, *Chemcontrol, Wastes, Industrial wastes, Foreign countries, Water pollution sources, Water pollution treatment, Effluents, Waste treatment, Distillation, Toxicity, Activated sludge, Microorganisms, Biological treatment, Foaming, Wood distillation, Chemical industry, Showers, Sprinklers.

Foam control in aeration tanks at the Syava wood chemical plant (USSR) is achieved with sprinklers. Because of inadequate control and clogging of the sprinkler nozzles, a study was made to determine the foam control efficiency of several chemical agents. These included turbine oil, axle oil, solar oil, four commercial antifoam agents, synthetic aliphatic alcohols (5.8, 7-12, and 10-18 carbon fractions), and the distillation residue of the 7-9 carbon fraction. The alcohols were effective, their effectiveness increasing with increasing molecular weight. The distillation residue was the most effective. The alcohols and the distillation residue were tested for their toxicity to the activated sludge microflora and their effect on the biological oxidation process. They were found to be nontoxic and to have no effect on oxidation. The use of the distillation residue for foam control at wood chemical plants (silvichemical factories) is recommended. (Stapinski-IPC)
W79-02382

DESALINATION IN THE REUSE OF INDUSTRIAL WASTE WATER,
Water Reuse Promotion Center, Tokyo (Japan).
H. Ogasawara, Y. Kunisada, H. Kaneda, and M. Hirai.
Desalination, Vol. 23, No. 1/3, p 113-122, 1977. 7 fig, 4 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Reverse osmosis, *Electrodialysis, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Waste treatment, Foreign countries, Asia, Pulp wastes, Desalination processes, Water purification, Activated sludge, Coagulation, Sedimentation, Lime, Neutralization, Sands, Filtration, Activated carbon, Adsorption, Reverse osmosis, Ions, Calcium, Sodium, Chlorine, Japan.

Studies to determine the feasibility of desalination of industrial waste waters were conducted by the Water Reuse Promotion Center (Japan) at a petrochemical plant and the Iwakuni pulp and paper mill of Sayo Kokusaku Pulp Co. Kraft bleach plant effluent was neutralized with caustic and treated with activated sludge, followed by coagulation and sedimentation with lime, neutralization by carbonation, sand filtration, activated carbon adsorption, and desalination by electrodialysis or reverse osmosis. Electrodialysis removed Ca, Na, and Cl ions at a high ratio. (Swichtenberg-IPC)
W79-02383

NITRATE REDUCTION BY DENITRIFYING BACTERIA IN SINGLE AND TWO STAGE CONTINUOUS FLOW REACTORS.
Queen's Univ., Kingston (Ontario). Dept of Chemical Engineering
D. J. R. Dodd, and D. H. Bone
Water Research, Vol 9, No 3, p 323, 328, March 1975. 6 fig, 1 tab, 5 equ, 18 ref.

Descriptors: *Denitrification, *Nitrates, *Bacteria, Chemical reactions, *Waste water treatment, *Biological treatment, Continuous flow reactors, *Denitrifying bacteria.

Denitrification by a mixed bacterial population of medium containing 100 mg NO3-Nl-1 and acetate as carbon source was studied in batch, a single stage continuous flow stirred reactor (CFSTR) and a two stage CFSTR at 30 degrees C. The optimum pH for denitrification, nitratase, nitrite reductase activities and growth was found to be 7.5 in batch culture. (Skogerboe-Colo St)
W79-02406

PARTIAL CHARACTERIZATION OF CHLORINATED ORGANICS IN SUPERCHLORINATED SEPTAGES AND MIXED SLUDGES,
Municipal Environmental Research Lab., Cincinnati, OH
R H Wise, T A Pressley, and B M Austern
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 529, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/2-78-020, March 1978. 29 p, 1 fig, 5 ref.

Descriptors: Pollutant identification, *Waste treatment, *Sludge treatment, *Chemical analysis, *Chlorination, *Inorganic compounds, *Organic compounds, *Laboratory tests, Septages, Sewage treatment, Sludge disposal, Chemical reaction, Organic wastes, Organic matter, Liquid wastes, Schoniger-flask combustion, Septic tanks

The chlorinated organic materials produced by the Purifax process, a method for superchlorinating concentrated biological wastes to stabilize them, was studied to determine which types of chlorinated organics it produces, how such compounds are likely to be discharged, and the amount of liquids and or solids produced. Purifaxed samples of septage and mixed primary/secondary sludges were separated into solid and liquid phases, and analyzed for their chlorinated organic content. Total organic chlorine in the solid phases were determined by Schoniger-flask combustion. Both solid fractions contained 0.9% to 1.0% total organic chlorine, based on dry weight. Concentrated hexane-ether extracts of the liquid phases were analyzed for total organic chlorine by microcoulometric titration, and then analyzed by GC/MS for individual organic compounds. GC/MS analysis of the hexane-ether extracts and the helium-purgable, volatile organics in the unextracted phases yielded slighly higher concentrations of the same kind of organic compounds typically present in U.S. water supplies. Cyanogen chloride was present in all of the unextracted Purifax liquid phases in concentrations reaching 900 micrograms/l. It is recommended that the gaseous phase of the Purifax process which is discharged from the reactor along with the solid and liquid phases, be analyzed. (Davison-IPA)
W79-02413

TREATMENT EFFECTIVENESS FOR THE REMOVAL OF SELECTED CONTAMINANTS FROM DRINKING WATER.
Stone (Ralph) and Co., Inc., Los Angeles, CA
For primary bibliographic entry see Field 5F.
W79-02435

ADVANCES IN STORM AND COMBINED SEWER POLLUTION CONTROL ABATEMENT TECHNOLOGY,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
A. Cywin, and W. A. Rosenkranz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 302, Price codes: A03 in paper copy, A01 in microfiche. Presented at the 4th Annual Conference of the Water Pollution Control Federation, San Francisco, CA, October 3-8, 1971. 29 p, 5 fig, 42 ref.

Descriptors: *Storm runoff, *Pollution abatement, *Sewers, *Water pollution sources, *Storm water treatment, Drainage systems, Storm drains, Urban drainage, Storm water, Separated sewers, Surface runoff, Storage, Storm water storage, Sewage treatment, Storm water quality, Sewage bacteria, Overflow, Waste water treatment, Flow control.

The combined sewer overflow pollution problem is viewed as a reflection of the inefficiencies inherent in the collection, transport, and treatment systems. The entire sewage system must be evaluated prior to the planning of modifications to provide the capability to adequately control and treat waste waters during and immediately following storms. Applicable solutions involve control facilities such as in and off-system storage, flow regulation and routing, remote flow-sensing and control coupled with treatment. Physical, chemical, biological and physical-chemical treatment methods are under investigation, with a screening dissolved-air flotation process and a high-rate multi-media filtration process offering the best current potential for producing good quality effluents. (Davison-IPA)
W79-02437

MANPOWER UTILIZATION AND FUTURE NEEDS OF MANUFACTURING INDUSTRIES IN WATER POLLUTION CONTROL,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-02438

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR TOXAPHENE MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 676, Price codes: A07 in paper copy, A01 in microfiche. Final Report No EPA-440/9-76-013, February 1976. 136 p, 16 fig, 10 tab, 53 ref, 2 append. MRI 4127-C. 68-01-3524.

Descriptors: *Waste water treatment, *Insecticides, *Toxaphene, *Industrial wastes, *Pesticides, Adsorption, Sedimentation, Activated carbon, Reduction degradation, Effluents, Pollutants, Estimated costs, Cost comparisons.

Toxaphene, produced by chlorination of camphene, with the resulting by-product of hydrogen chloride, is manufactured by four companies in the U.S.: Hercules, Inc., Tennaco Chemicals, Inc., Riverside Chemical Company, and Vicksburg Chemical Company. Current waste water management practices of the toxaphene industry and potential waste water treatment processes applicable to this industry are examined; a selection of those processes applicable to the Environmental Protection Agency's (EPA) toxic pollutant control technology requirements are discussed. The four toxaphene producing plants and their water treatment methods are characterized. The alternate systems considered for removing toxaphene from waste water are: (1) adsorption on synthetic resins, (2) reductive degradation, and (3) carbon adsorption. The systems have not been operated under conditions approximating actual use for toxaphene removal, and they have not been developed so that an accurate determination of costs or operating conditions can be made. A comparison of the effluents produced by the alternate treatment systems with the EPA guidelines with regard to Levels I, II and III technology is presented. Waste water treatment cost estimates, based on capital investment costs and annual operating costs, are discussed for currently used toxaphene waste water treatment, and for alternate waste water treatment systems. (Davison-IPA)
W79-02439

ASSESSMENT OF HAZARDOUS WASTE PRACTICES IN THE PETROLEUM REFINING INDUSTRY,
Jacobs Engineering Co., Pasadena, CA.
D. G. Rosenberg, R. J. Lofy, H. Cruse, E. Weisberg, and B. Beutler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 097, Price codes: A16 in paper copy, A01 in microfiche. Final Report No SW-129c, June 1976. 367 p, 23 fig, 140 tab, 57 ref, 15 append. 68-01-2288.

Descriptors: *Waste treatment, *Oil wastes, *Industrial wastes, *Hazardous wastes, *Cost analysis, Anaerobic digestion, Lagooning, Incineration, Landfills, Land spreading, Chemical analysis, Waste analysis, Disposal, Metals, Organic wastes, Sludge treatment.

A study was conducted: (1) to determine the nature, quality, and projected future quantity of potentially hazardous wastes generated by the petroleum refining industry in the U.S.; (2) to evaluate current waste management practices; (3) to examine improved technologies for waste treatment and disposal, the application of which would result in future reduction of waste hazard; and (4) to calculate the costs for three levels of waste treatment and technology. The industry is characterized in terms of refining processes employed, and future trends in petroleum refining and waste management are discussed. A total of 14 trace elements were selected for identification and measurement in refinery waste streams. Potentially hazardous organic compounds were too numerous for individual analysis; therefore, oil represented a composite of hazardous organic substances, and all refinery samples were analyzed to determine their constitutent percentages of oil water and solids. At the present time, 63% of refinery wastes are disposed of by landfilling, 28% by lagooning, 7% by landspreading and 2% by incineration. It is projected that recycling and reclamation of materials used in refining will increase, and that off site landfill disposal and lagooning will decrease; landspreading will increase. The cost to industry for waste treatment/disposal using three levels of technology varies from $1.80 to $260.93 metric ton with maximum 1974 costs estimated to be $54,216,000. Implementation of Level II or Level III technology can be achieved as an estimated cost to industry to $74,049,000. (Davison-IPA)
W79-02440

STORM AND COMBINED SEWER POLLUTION CONTROL PROGRAM REPORTS. RESEARCH, DEVELOPMENT, AND DEMONSTRATION GRANT, CONTRACT, AND IN-HOUSE PROJECT REPORTS.
National Environmental Research Center, Edison, NJ. Edison Water Quality Research Div.
For primary bibliographic entry see Field 5G.
W79-02442

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR DDT MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 013, Price codes: A05 in paper copy, A01 in microfiche. Final Report No EPA-440/9-76-009, June 1976. 99 p, 7 fig, 8 tab, 38 ref, 1 append. MRI-4127-C. 68-01-3524.

Descriptors: *Waste water treatment, *Industrial wastes, *DDT, Acidic waters, Alkaline water, Solvent extractions, Cost analysis, Cost comparisons, Adsorption, Activated carbon, Synthetic resin.

The treatment of waste water resulting from the production of DDT by Montrose Chemical Corporation, the sole U.S. manufacturer of DDT, is examined. Alkaline waste water and acid waste water that results from the production process are presently hauled offsite by truck and disposed of in an approved class 1 California dump. Four alternative alkaline waste water treatment systems being considered for reducing the concentration of DDT and related compounds and the daily load are examined in detail. The four systems are: a solvent extraction/Friedel-Crafts method; a two-stage solvent extraction system; activated carbon adsorption; and synthetic resin adsorption. A summary of estimated costs for these selected alkaline waste water treatment systems is shown, and the concentration of DDT in the treated effluent is estimated. (Gibson-IPA)
W79-02444

BENZIDINE: WASTEWATER TREATMENT TECHNOLOGY,
Keinath (Thomas M.), Senaca, SC.
T. M. Keinath.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 024, Price codes: A07 in paper copy, A01 in microfiche. Final Report No EPA-440/9-76-018, June 1976. 131 p, 7 fig, 17 tab, 30 ref, 4 append. WA-6-99-1309-A and 68-01-3390.

Descriptors: *Waste water treatment, *Benzidine, *Industrial wastes, *Treatment facilities, Chemical industry, Cost analysis, Cost comparisons, Oxidation, Adsorption, Ozone, Nitrous acid, Activated carbon, Activated sludge, Biological treatment, Surveys, On-site investigations.

Information is provided on: (1) the occurrence of benzidine in the waste waters of synthetic organic chemical manufacturing facilities; (2) the occurrence of benzidine in the waste waters of benzidine-based dye users; (3) prospects for no aqueorus discharge; (4) applicable waste water treatment technology; and (5) to establish the effect of benzidine on publicly owned waste water treatment facilities. Material was gathered, in part, through a questionnaire survey and personal visits to benzidine-based dye manufacturers and applicators. Results indicate that: (1) available manufacturers' housekeeping measures are adequate to prevent the discharge of benzidine directly to process lines; (2) benzidine in waste water can effectively be treated by oxidation with nitrous acid and ozone and adsorption with granular activated carbon, however, costs vary; and (3) pretreated benzidine will not adversely affect municipal biological waste water treatment systems. (Gibson-IPA)
W79-02445

ADSORPTION OF POLIOVIRUS TYPE I TO WASTEWATER TREATMENT PLANT SOLIDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
R. S. Kamdar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 312, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1978. 109 p. 10 fig, 9 tab, 58 ref. (California Water Resources Center Project UCAL-WRC-W-523). OWRT B-184-CAL(1).

Descriptors: *Viruses, *Waste water disposal, *Waste water treatment, Isotherms, Adsorption, *Poliovirus Type I, Solid wastes, Cations.

The association of poliovirus type 1 (CHAT), a human enteric virus, to solid products of the secondary wastewater treatment process was investigated. These studies have demonstrated a fraction of the total poliovirus present became associated with the solids. The solids-associated viruses retained their infectivity in the tissue culture monolayer; therefore, the association of virus with solids cannot be equated to inactivation. Most of the associated virus can be eluted from the solids in viable form. Thus, the process is reversible. Most of the association of virus to the solids occurred rapidly within the first five minutes of the contact period. Association was enhanced markedly in the

presence of metal cation. Sonication of the solids sample increased the association. The association of poliovirus to wastewater solids is an adsorption process and conforms to the Freundlich isotherm, an empirical relation described by $q = u\ Cen$ where q is the number of viruses adsorbed per unit mass of solids, Ce is the virus concentration remaining in solution at equilibrium, and u and n are empirical constants. The range of virus concentration used was 10 to the fifth power to 10 to the eighth power PFU per liter. Solids concentration studied varied from 20 to 4800 mg/l. (Snyder-Calif, Davis)
W79-02446

POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
For primary bibliographic entry see Field 5B.
W79-02451

FISH FARMS ARE HAVING TO WATCH THEIR WASTE.
Vandkvalitetsinstitutet, Hoersholm (Denmark).
For primary bibliographic entry see Field 5G.
W79-02474

PROTEIN PRODUCTION RATES BY ALGAE USING SWINE MANURE AS A SUBSTRATE,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, E. W. R. Barlow, J. R. Miner, H. K. Phinney, and J. E. Oldfield.
In: Energy, Agriculture and Waste Management, Proceedings of the 1975 Cornell Agricultural Waste Management Conference. p 475-493 (1975). Ann Arbor Science, Publishers. Ann Arbor, Michigan, 2 fig, 15 tab, 27 ref. OWRT B-039-ORE(4) and B-044-ORE(1).

Descriptors: *Farm wastes, Waste management, Hogs, Nutrient recovery, *Proteins, Algae, *Proteins, *Recycling.

A system is described for recycling nutrients contained in animal manure by growing algae using the digested waste as a substrate. The most encouraging aspect of the studies described has been the stability of the Chlorella vulgaris 211/8K cultures growing in fresh swine manure diluted to an ammonium nitrogen content of 250 mg/liter. Further dilutions reduced the growth rate. Manure solutions with higher nitrogen concentrations were not tested. Clarification of the manure by filtration through activated carbon or ferric chloride flocculation improved the light transmission dramatically. However, the algal growth rates were substantially lower in the clarified solutions. The superiority of the untreated swine manure was attributed to the higher organic matter content. It was suggested that the organic matter provides CO2 for algal photosynthesis by acting as a substrate for growth of bacteria. This observation was further substantiated by experiments in which CO2 was added to the cultures.
W79-02489

5E. Ultimate Disposal Of Wastes

ECONOMIC EVALUATION OF FOUR SLUDGE DEWATERING DEVICES,
For primary bibliographic entry see Field 5D.
W79-02037

YOU CAN TAILOR EFFLUENT BOD TO FIT THE RECEIVING-WATER ECOSYSTEM...AND ENHANCE THE ENVIRONMENT. URBAN AND FISH-PROCESSING WASTES IN THE MARINE ENVIRONMENT: BIOENHANCEMENT STUDIES AT TERMINAL ISLAND, CALIFORNIA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
D. F. Soule, M. Oguri, and J. D. Soule.
Sea Grant Reprint No. UCCSG-R-04-78. Reprinted from: Bulletin of the California Water Pollution Control Association, Vol 15, No 1, p 58-63, July 1978. 4 fig, 11 ref.

Descriptors: *Coasts, *Nutrients, *Waste disposal, *Ecosystems, Water quality, Organic wastes, Biochemical oxygen demand, California, *Bioenhancement, Fish processing wastes, Waste management.

Coastal marine waters, among the richest ecosystems in existence, are largely dependent upon nutrients of terrestiral origin. Where man has reduced or eliminated marshlands and river flow, urban sewage systems offer virtually the only nutrient source for sustaining diverse marine life. Studies at Terminal Island, California indicate that domestic sewage and fish-processing effluents supplied large organic molecules (proteins, amino acis, carbohydrates and fats) which enhanced the environment as they were recycled through the food chain or web. Methods were being developed for managing the levels of oxygen demand in the waste load, according to the assimilation capacity of the receiving waters, rather than destroying the nutrients by feeding only bacteria to secondary waste-treatment plants. The residual nutrients in the wastes after secondary treatment do not support the same diverse ecosystem, and depletion of after secondary treatment do not support the same diverse ecosystem, and depletion of biota may result. Rather, emphasis should be placed on point-source control and removal of toxicants without depriving the coastal organisms of their historic nutrient supply. In the future, energy-rich effluents should be used by developing alternative methods for waste management and new regulatory concepts, rather than imposing traditional secondary treatment. (NOAA)
W79-02164

UNDERGROUND INJECTION CONTROL PROGRAM STUDIED.
For primary bibliographic entry see Field 5G.
W79-02184

BARK AS A MEDIUM FOR GRAVITY DEWATERING OF SECONDARY SLUDGE FROM PULP AND PAPER MILLS.
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-02186

DREDGE SPOIL IN MISSISSIPPI SOUND,
University of Southern Mississippi, Hattiesburg. O. L. Paulson, Jr., C. M. Gross, J. C. Hovanesian, and R. J. Tarbutton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 706, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute, Mississippi State University, Mississippi State, Report October 1978. 38 p, 23 fig, 3 tab, 6 ref, 2 append. OWRT A-108-MISS(1), 14-34-0001-8026.

Descriptors: Dredging, Spoil, Channel improvements, Islands, Water circulation, Turbidity, Hydrography, Bathymetry, Tides, Streamflow, Wind, Sediment sampling, Sediment transport, Cores, Size, *Waste disposal, *Dredge spoil disposal, Gulfport(Miss), *Mississippi, *Mississippi Sound(Miss).

The disposal of 26.6 million cubic yards of dredged material to be removed during the proposed Gulfport Harbor expansion is the basis for studying existing dredge spoil deposits in Mississippi Sound and the physical processes acting upon these deposits. Sediment analysis of cores from dredge spoil near Gulfport was performed to determine physical properties of the spoil and to determine direction of sediment transport. Bathymetric data, tide data, wind data, streamflow data, current velocities, current directions and turbidity patterns from LANDSAT photos were used in determining physical factors affecting circulation and sediment transport in the Sound. Data from this study indicates that maximum turbidity within the Sound occurs during periods of high discharge from the rivers entering the Sound. Additional turbid conditions are produced over shallow areas by tides and wind-driven waves. Dredge spoil cores contained layers of medium grained sand with higher percentages of clay to the north and northwest. Layering is thought to be due to addition of spoil to existing spoil bank. These data, coupled with a study of historical changes in the configuration of Round Island, indicate that erosion would occur on the south and east side of dredge spoil banks or islands. Submarine prolongation could be expected on the north and northeast side of such a deposit. Orientation of future dredge spoil with this prevailing direction of sediment transport should serve to improve stability and reduce both original and maintenance costs.
W79-02188

LIQUEFACTION POTENTIAL OF HYDRAULIC FILLS.
Army Engineer District, Los Angeles, CA.
For primary bibliographic entry see Field 8D.
W79-02203

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02256

STRATIGRAPHY AND HYDROGEOLOGIC CORRELATION STUDIES IN SEVERAL CYPRESS DOMES-NORTH CENTRAL FLORIDA,
Florida University, Gainesville, Department of Geology
D. P. Spangler, D. P. Gillespie, and J. D. Lundy.
In: Third Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 110-128, 1976. 9 fig, 13 ref.

Descriptors: *Swamps, Stratigraphy, *Waste water disposal, Wetland, Geologic mapping, Hydrogeology, Groundwater, Florida.

A stratigraphic study of several cypress domes suggests their viability as depositories for secondarily treated wastes, particularly where the Hawthorn clays (aquiclude) is present. A secondary conclusion resulting from this work has been the relationship of hardpans, dolomites, and phosphates to domal areas. These relationships are best noted in several presented cross sections, particularly those containing natural gamma radiation logs. Tentative correlations are possible between these data and the gamma logs. Further study is indicated and needed to describe the origin, movement, and deposition of iron, manganese, calcium, magnesium, phosphate, uranium, and randon with respect to cypress domes and their underlying groundwater systems. (See also W79-02256) (Steiner-Mass)
W79-02259

HYDROLOGY OF THE AUSTIN CARY CONTROL DOME,
Florida Univ., Gainesville. Dept. of Geology; and Florida Univ., Gainesville, FL. Center for Wetlands.
D. Gillespie.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 129-156, 1976. 9 fig, 3 tab, 10 ref.

Descriptors: *Swamps, *Hydrogeology, *Geologic mapping, *Waste water disposal, *Stratigraphy, *Florida, Wetlands, Hydrologic properties, Water balance, Hydrologic budget, Water table, Waste water, Aquifers, Permeability

Hydrogeologic parmeters considered in examining the feasibility of using the Austin Cary Control cypress dome for water table management and recycling secondarily treated wastes include: permeability of the underlying materials, flow routes and rates of surface and or groundwater and ex-

change capacity or filterability of aquifers and aquicludes. Infiltration of treated wastes into the Floridan Aquifer is a main concern. Comparisons with two shallow aquifers and a secondary aquifer of the Hawthorn Formation reveals that recharge from surface waters and precipitation decreases with depth. The shallow surface aquifer is heavily influenced by surface water giving rapid responses. The shallow artesian aquifer is also influenced, but gives slower and diminished responses. Recharge to the secondary aquifer is minimal and shows a definite lag time. This is an indication that very little vertical groundwater movement would be expected down to the Floridan aquifer due to a thick sequence of impermeable clays separating it from the surface waters and precipitation. (See also W79002256) (Steiner-Mass)
W79-02260

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON SURROUNDING SOIL MOISTURE AND NUTRIENT CONTENT AND ON GROWTH OF PINE TREES (SUMMARY OF MS THESIS),
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02273

NITROGEN TRANSFORMATIONS IN WATER AND SEDIMENTS OF CYPRESS DOMES WITH AND WITHOUT ADDED SEWAGE EFFLUENT,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W79-02276

THE EFFECTS OF PERTURBATION ON CYPRESS DOME ANIMAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02279

THE PROJECTED COST OF CYPRESS WETLAND DISPOSAL FOR WALDO, FLORIDA,
Florida Univ., Gainesville. Center for Wetlands.
J. Ordway.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville. p 803-811, 1976. 2 fig, 1 tab, 2 ref.

Descriptors: *Swamps, *Waste water disposal, *Cost analysis, Wetlands, Florida, Sewage.

The general costs for using cypress wetlands as recycling sites for secondarily treated sewage are considered for the city of Waldo, Florida. using one preliminary design, the total cost for this wetland treatment site was 42.2 cents per 1000 gallons compared with 62 cents per 1000 gallons for spray irrigation and 106 cents per 1000 gallons for advanced waste treatment. (See also W79-02256)(Steiner-Mass)
W79-02286

CYPRESS GROWTH RESPONSE IN A SEWAGE-ENRICHED POND CYPRESS ECOSYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02287

INVESTIGATIONS OF HEAT TREATMENT FOR PAPER MILL SLUDGE CONDITIONING,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, MI. Central-Lake STates Regional Center.
D. W. Marshall, F. C. Fiery, and R. O. Blosser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 013, Price codes: Price codes: A00 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series EPA-600/2-78-015, 85 p, February, 1978. 33 fig, 46 ref. 15 tab.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, *Heat treatment, Wastes, Industrial wastes, Sludge, Pulp and paper industry, Water pollution sources, Activated sludge, Biochemical oxygen demand, Color, Groundwood fines.

Heat treatment improved the filterability of groundwood fines and of waste sludges from the activated sludge treatment of pulp and paper mill waste waters. The improved filterability was related to the solubilization of volatile constituents up to an optimum solubilization of 40-60%. However, heat increased the BOD and color of the sludge filtrates. (Witt-IPC)
W79-02296

TREATMENT OF HIGH STRENGTH MEAT-PACKING PLANT WASTEWATER BY LAND APPLICATION,
Texas Univ. at Paso. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-02301

HANDLING AND DISPOSAL OF SLUDGES FROM COMBINED SEWER OVERFLOW TREATMENT. PHASE II - IMPACT ASSESSMENT,
Envirex, Inc., Milwaukee, WI. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W79-02303

METHOD OF TREATING A WASTE LIQUID CONTAINING POLLUTING COMPOUNDS,
For primary bibliographic entry see Field 5D.
W79-02324

PERIMETER DIKE RAISING WITH DEWATERED FINE-GRAINED DREDGED MATERIAL AT UPPER POLECAT BAY DISPOSAL AREA, MOBILE, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. A. Haliburton, J. Fowler, and J. P. Langan.
Miscellaneous Paper D-78-3, August 1978. 66 p, 2 tab, 23 fig, 8 ref.

Descriptors: *Dewatering, *Dikes, *Dredged material, *Waste disposal sites, *Fine grained soils, *Polecat Bay(Ala).

Use of dewatered fine-grained dredged material for large-scale perimeter dike raising was evaluated by a cooperative field demonstration between the U.S. Army Engineer District, Mobile, and the Dredged Material Research Program (DMRP) Disposal Operations Project (DOP) and Productive Uses Project. After conduct of the field demonstration, it was determined: (1) Fine-grained dredged material of high plasticity may be used successfully in large-scale dredged material disposal site perimeter dike-raising activities, once the material has been successfully dewatered with DMRP DOP-developed procedures. (2) The cost of dike raising with the dewatered fine-grained dredged material was less than estimated for use of offsite borrow, even though the demonstration site had good haul access. (3) Three different methods for dewatered dredged material borrow removal and three different methods for perimeter dike raising were evaluated and found to be technically feasible and operationally practical. Corps of Engineers field elements and other interested agencies should seriously consider the use of dewatered fine-grained dredged material for large-scale perimeter dike-raising activities, following the construction procedures described and evaluated in the report. Such construction may be extremely cost effective at remote locations where offsite borrow is particularly expensive. (WES)
W79-02345

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO; APPENDIX A: PLANKTONIC COMMUNITIES, BENTHIC ASSEMBLAGES, AND FISHERY,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
R. A. Sweeney.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-42, July 1978. 330 p, 36 tab, 119 fig, 101 ref, 3 append.

Descriptors: *Aquatic environment, *Lake Erie, *Ohio, *Benthic fauna, *Benthic flora, *Plankton, Fish, Biota, *Dredged material disposal, *Waste disposal sites, *Ashtabula River(Ohio).

An investigation to evaluate impacts of the release of dredged material on phytoplankton, zooplankton, benthic macroinvertebrates, and fish was conducted in Lake Erie off Ashtabula, Ohio, from June 1975 through September 1976. Samples and measurements were taken prior to, during, and after the release of materials from a hopper dredge during August 1975 and May 1976. Pelagic biota (phytoplankton, zooplankton, and fish) along with primary productivity were only mildly impacted and recovery was relatively rapid. The benthic communities were altered with the decline of some species and introduction of new fauna transported from the dredged sites. Within a year species diversity had largely returned to predisposal levels. However, the community structures were slightly altered. These changes were similar to those noted in marine environments exposed to dredged material. (WES)
W79-02346

ABILITY OF SALT MARSHES TO REMOVE NUTRIENTS AND HEAVY METALS FROM DREDGED MATERIAL DISPOSA AREA EFFLUENTS,
H. L. Windom.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-37, December 1977. 100 p, 7 tab, 12 fig, 25 ref, 5 append.

Descriptors: *Salt marshes, *Nutrients, *Heavy metals, *Pollutants, *Effluents, *Dredged material disposal, *Waste disposal sites.

Experimental raceways were constructed in a salt marsh adjacent to a dredged material confinement area to evaluate use of this environment as an overland flow advanced treatment system for effluent resulting from dredged material disposal. The program was designed to determine the ability of salt marsh systems to remove nitrogen, phosphorus, iron, manganese, cadmium, copper, nickel and zinc from effluent. Application rates varied between 0.06 and 3.7 acre inches per day and concentrations of the contaminants were determined in the effluent from the disposal area and discharge from the experimental system. All contaminants were found to decrease in the effluent as it passed through the experimental raceways. Removal efficiencies for nitrogen and phosphorus varied up to 50 and 70 percent, respectively. Mean metal removal efficiencies ranged between 15 and 32 percent. Efficiency of removal appeared unrelated to application rate but did appear toincrease with concentration. Contaminants accumulated in sediments with only minor increases in salt marsh vegetation. Although resuls indicate nutrients and heavy metal concentrations in effluents from dredged material disposal areas can be reduced during passage through a salt marsh, conclusions about efficiency or removal may be influenced by the size of the experimental system used. (WES)
W79-02347

FLUME EXPERIMENTS ON SAND, SILT, AND CLAY MIXTURES FROM THE OFFSHORE DREDGED MATERIAL DISPOSAL SITE, GALVESTON, TEXAS,
Texas A and M Univ., College Station. Dept. of Oceanography.
A. J. Moherek.
Army Engineer Waterways Experiment Station,

Vicksburg, Mississippi, Technical Report D-78-34, June 1978. 204 p, 6 tab, 66 fig, 42 ref, 6 append.

Descriptors: *Texas, *Gulf of Mexico, *Flumes, *Sediment transport, *Dredged material disposal, *Waste disposal sites, *Galveston(Tex).

Flume experiments were performed on four sediment mixtures sampled from the offshore Galveston dredged material disposal site in order to determine their critical erosion velocity, shear stress, and modes of sediment transport. Also, and analysis of the offshore Galveston hydrographic regime was performed using meteorologic and oceanographic data. Results indicated the four sediment mixtures eroded similarly. Extapolation of flume results to recorded off-shore bottom current speed measurements indicate bedload erosion occurs much more frequently near the northern margin of the disposal site. Also, net bedload transport of disposal material is oriented down the coast or offshore from the disposal site, suggesting that material will not likely return to the channel proper as shoaling sediment. (WES)
W79-02348

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON, EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5C.
W79-02350

EXPERIENCE WITH DRUM DRYERS FOR ACTIVATED SLUDGE (OPYT NALADKI BARABANNYKH SUSHILOK AKTIVNOGO ILA),
D. A. Narinskii.
Bumazhnaya Promyshlennost', No. 4, p 30-31, April, 1978. 1 fig, 1 tab.

Descriptors: *Activated sludge, *Sludge treatment, *Drying, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Foreign countries, Pulp wastes, Pulp and paper industry, Sludge, Equipment, Drum dryers

Progress-brand drum dryers have been installed at several Soviet paper mills for drying excess activated sludge (dewatered on vacuum filters to 80-85% moisture content) to a moisture content of 30-40%. However, the standard nozzles did not break up the sludge sufficiently, resulting in a low drying efficiency. Progress-brand dryers installed at the Arkhangel'sk mill were studied and reconstructed. The reconstructed dryers operate satisfactorily: the dried sludge has a moisture content of 20-40%, and the dryer efficiency is 60-70 kg water/cu m/hr at a heat consumption of 950-1,000 kcal/kg of evaporated water. It is pointed out that the use of the dryers can be economically justified only if the dried sludge is subsequently burned with recovery of heat. (Stapinski-IPC)
W79-02385

QUANTITATIVE MAPPING BY REMOTE SENSING OF AN OCEAN ACID-WASTE DUMP,
National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W79-02407

ANALYSIS OF THE ENVIRONMENTAL CONTROL TECHNOLOGY FOR OIL SHALE DEVELOPMENT,
Utah Univ., Salt Lake City. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-02432

A STATISTICAL EVALUATION OF SOME COLUMBIA RIVER BASALT CHEMICAL ANALYSIS,
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
For primary bibliographic entry see Field 5A.
W79-02433

ASSESSMENT OF HAZARDOUS WASTE PRACTICES IN THE PETROLEUM REFINING INDUSTRY,
Jacobs Engineering Co., Pasadena, CA.
For primary bibliographic entry see Field 5D.
W79-02440

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS, DOCUMENT NO 2.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 155, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA/530/SW-151.2, December 1975. 20 p, 9 ref.

Descriptors: *Waste disposal, *Environmental effects, *Public health, Publications, Water pollution, Water pollution effects, Soil contamination, Oil wastes, Missouri, Colorado, Texas, Chemical wastes, Groundwater, Ponds, Industrial wastes, Sand pits, Surface waters, Water wells.

Three incidents of improper land disposal of hazardous wastes are documented as part of an investigation to determine the impact of such practices on public health and on the environment. The incidents reported are: (1) the spraying of dioxin-contaminated waste oil on three horse arenas and a farm road in Missouri in May and June 1971; (2) the disposal of chemical wastes in unlined ponds between 1943 and 1957 causing contamination of groundwater beneath the Rocky Mountain Arsenal and surrounding area between Denver and Brighton, Colorado; and (3) the disposal of acidic and oily industrial wastes into an unlined, abandoned sand pit in Crosby, Texas, between the mid-1960s to 1971 causing contamination of ground-and surface waters which affected domestic wells. (Gibson-IPA)
W79-02443

ADSORPTION OF POLIOVIRUS TYPE I TO WASTEWATER TREATMENT PLANT SOLIDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
For primary bibliographic entry see Field 5D.
W79-02446

VIRUS TRANSPORT THROUGH SOLID BEDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
For primary bibliographic entry see Field 5B.
W79-02447

EFFECTS OF BURIAL ON THE HEART COCKLE CLINOCARDIUM NUTTALLII AND THE DUNGENESS CRAB CANCER MAGISTER,
Fisheries and Marine Service, West Vancouver (British Columbia).
For primary bibliographic entry see Field 5C.
W79-02472

THE EFFECT OF SILT-FENCE ON THE PREVENTION OF SEA WATER SILTATION CAUSED BY DREDGING AND RECLAIMING WORK IN HARBOR, (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
For primary bibliographic entry see Field 5C.
W79-02481

5F. Water Treatment and Quality Alteration

COPPER SULFATE HELPS CONTROL MICORGANISMS IN RESERVOIRS,
S. B. Tuwiner.
Water and Sewage Works, Vol. 123, No. 12, p 68-70, December 1976. 20 ref.

Descriptors: *Water treatment, *Copper sulfate, *Reservoirs, *Algae, Pre-treatment(Water), Eutrophication, Chlorination, Water purification, Hypochlorite, Water pollution control.

There is a general increase in organic matter in potable water derived from discharges and biosynthesis in surface water supplies and from plankton in reservoirs. This organic matter is treated with chlorine and hypochlorite which produces chlorinated organics potentially dangerous to health. Copper sulfate added to reservoirs prevents algal growth ad thereby reduces the amount of organic matter that would otherwise be subject to chlorination. The combined objective of water purification should be: (1) to provide treatment plus pre-treatment, (2) to minimize the final chlorine demand, and (3) to provide free chlorine in post-treatment. Copper sulfate is used to prevent the synthesis of organic matter by algae and to reduce filter clogging; filters may then more effectively remove organics and reduce turbidity. Copper sulfate is also protective against certain carcinogens. While there is no evidence that the compound has this protective effects in water it would be unwise to eliminate copper sulfate treatment until its lack of uselfulness against carcinogens in water is proven. (Harris-Wisconsin)
W79-02018

THE PROJECTED COST OF CYPRESS WETLAND DISPOSAL FOR WALDO, FLORIDA,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5E.
W79-02286

WATER PURIFIER,
Teledyne Industries, Inc., Fort Collins, CO. (Assignee).
T. E. Corder.
U.S. Patent No. 4,107,046, 16 p, 22 fig, 29 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1250, August 15, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Filtration, Flow control, Filters.

A filter cartridge, for an internally by-passable water purifier apparatus, is in the form of a tubular shell that has inlet and outlet walls with at least one opening being defined in each. A water filtering material is placed within the shell. Running lengthwise of the shell is an arrangement for guiding water from the inlet to the outlet regions and exclusive of the filtering material. That arrangement is either interiorly of or external to the shell. The cartridge is usable in a purifier apparatus that has a housing with an inlet for the flow of water as well as a single outlet area for discharging the flow of water. A channel defines the path of water flow from the inlet to the outlet, and a chamber is defined in that channel in the path of the flow. One valve in the channel controls the flow of water from the inlet through the cartridge to the outlet. In addition, another valve controls the flow of water from the inlet to the outlet along a path that by-passes the cartridge. (Sinha-OEIS)
W79-02308

HOME WATER DISTILLER,
F. C. Kirschman, and W. B. Bolte.
U.S. Patent No. 4,110,170, 7 p, 5 fig, 19 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2297, August 29, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, *Distillation, Condensation, Condensers, Temperature, Domestic water, Distiller.

A home distiller provides for an efficient distillation process. The inlet water supply is controlled as a function of the temperature of the output of the distiller and the inlet water is preheated by introducing it inot a chamber surrounding the condensor coils. After preheating, the water flows into the boiling chamber. The unit is provided with a flow-through or constant-flush drainage system to

keep mineral buildup to a minimum, and to provide for automatic control of the input water. (Sinha-OEIS)
W79-02319

METHOD FOR TREATING A MEDIUM CONTAINING WATER WITH COAGULANTS,
For primary bibliographic entry see Field 5D.
W79-02322

REVERSE OSMOSIS WATER UNIT,
P. D. Maples.
U.S. Patent No. 4,110,219, 6 p, 9 fig, 11 ref; Official Gazette of the United States Patent Office, Vol. 973, no 5, p 2313, August 29, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Reverse osmosis, Domestic water, Membrane processes, Activated carbon.

A portable water container for holding water treated by reverse osmosis water purification rests on a base. The base has a recess in which the reverse osmosis unit is laid. Water is supplied to the portable water container and an overflow is provided. The reverse osmosis unit can be quickly and easily removed from the base by merely lifting the osmosis unit from the recess and pulling stopper type end connectors from the ends. The walls of the recessed portion of the base restrains movement of the stopper end connectors from the osmosis units during use. The reverse osmosis unit also has activated carbon impregnated paper through which the water passes providing further water treatment. (Sinha - OEIS)
W79-02329

WATER TREATMENT APPARATUS AND METHOD,
Societe Degremont Paris (France). (Assignee).
R. Louboutin.
U.S. Patent No. 4,111,802, 12 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 1, p 329, September 5, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water pollution treatment, Separation techniques, Mixing, Flocculation, Chemical precipitation, Crystallization.

A method and apparatus for treating water by flocculation and/or cyrstalline-precipitation type treatments is described. The invention is particularly suitable for treating water which is charged or saturated with inorganic salts that can be precipitated in the form of a crystalline sludge by means of known chemical reagents with which they form compounds of low solubility. A single enclosure includes a reaction zone and a decanting zone. Water to be treated is introduced into the bottom of the reaction zone. A pump turbulently mixes the dwater and sludge within a turbulent area and passes the resultant mixture through a central passage at a rate several times higher than the rate at which the water is introduced into the reaction zone. A first portion of the mixture is recycled back into the turbulent area. A second portion of the mixture, including a relatively high concentration of sludge, is distributed to the bottom of the decanting zone, at a flow rate and at a pressure sufficient to ensure that the mixture of sludge and water will be distributed uniformly throughout the entire area of the lower portion of the decating zone. The purified water passes upward through the decanting zone and is collected. The sludge settles downward to the bottom ofthe decating zone and is returened to the turbulent area of the reaction zone. (Sinha - OEIS)
W79-02333

NOVEL COMPOSITIONS OF MATTER FOR USE IN THE TREATMENT OF AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
P. Miles, N. Richardson, and M. A. Finan.
U.S. Patent No. 4,111,804, 7 p, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 329-330, September 5, 1978.

Descriptors: *Patents, *Water treatment, *Scaline, *Water quality control, Desalination, Industrial water, Hardness(Water), Chemical precipitation, Calcium compounds, Magnesium, Organic compounds, Telmers.

A method is provided for inhibiting scale formation by salts of calcium, magnesium, barium and strontium from aqueous solutions over a wide range by adding to the aqueous solution a minor proportion of the product comprising a telomer. The telomeric compounds show good control of calcium carbonate, calcium sulphate and magnesium hydroxide scales and more importantly modify the crystal structure of the scale so that it is non-uniform and easily removable. (Sinha-OEIS)
W79-02335

EVALUATION OF SEMIPERMEABLE MEMBRANES FOR CONCENTRATION OR ORGANIC CONTAMINANTS IN DRINKING WATER,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-02405

COMPARISON OF METHODS FOR THE DETERMINATION OF TOTAL AVAILABLE RESIDUAL CHLORINE IN VARIOUS SAMPLE MATRICES,
Environmental Monitoring and Support Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W79-02412

TREATMENT EFFECTIVENESS FOR THE REMOVAL OF SELECTED CONTAMINANTS FROM DRINKING WATER,
Stone (Ralph) and Co., Inc., Los Angeles, CA.
J. R. Marsh, H. Y. Hsu, and M. Kilinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 271, Price codes: A09 in paper copy, A01 in microfiche. Final Report, March 1975. 197 p, 100 fig, 7 tab, 198 ref, 1 append. 68-01-2692.

Descriptors: *Water treatment, *Water pollution treatment, *Pesticide removal, *Potable water, Coagulation, Distillation, Filtration, Ion exchange, Chemical degradation, Polychlorinated biphenyls, Hazardous wastes, Trace elements, Radiation, Effluents, Influents, Associated costs, Carbon, Adsorption, Lime, Oxidation chemical precipitation, Electrodialysis, Reverse osmosis, Beryllium, Chlorinated hydrocarbon pesticides, Cobalt, Lithium, Antimony, Bis-ethers, Molybdenum, Nickel, Organophosphorus pesticides, Tungsten, Vanadium.

A literature search was initiated to summarize and evaluate all available data on removing the following hazardous substances from drinking water: antimony, beryllium, cobalt, lithium, molybdenum, nickel, tungsten, vanadium, bis-ethers, polychlorinated biphenels, chlorinated hydrocarbon insecticides, and organophosphorus insecticides. The characteristics of each contaminant are listed, and include: natural and industrial sources and uses; occurrence in drinking water supplies; toxicology; and a list of treatment and removal methods. Each treatment method is described separately in regard to process theory, process configurations and design, general and specific applications, and process economics. The processes discussed are adsorption, chemical oxidation, coagulation/precipitation, distillation, electrodialysis, ion exchange, radiochemical degradation, reverse osmosis, and ultra filtration. It is concluded that the best currently available method for treating all organic contaminants is activated carbon adsorption; inorganic contaminants can best be treated by lime coagulation. (Davison-IPA)
W79-02435

ASBESTOS IN THE WATER SUPPLIES OF THE TEN REGIONAL CITIES, PART I,
McCrone Research Inst., Chicago, IL.
For primary bibliographic entry see Field 5A.
W79-02441

5G. Water Quality Control

THE EFFECTS OF WEED-CUTTING ON THE MACRO-INVERTERATE FAUNA OF A CANALISED SECTION OF THE RIVER HULL, A NORTHERN ENGLISH CHALK STREAM,
James Cook Univ. of North Queensland, Townville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02002

AQUATIC PLANT MANAGEMENT IN SEMI-NATURAL STREAMS: THE ROLE OF MARGINAL VEGETATION,
Freshwater Biological Association, East Stoke (England). River Lab.
F. H. Dawson.
Journal of Environmental Management, Vol. 6, No. 3, p 213-221, May, 1978. 4 fig, 17 ref.

Descriptors: *Vegetation establishment, *Aquatic weed control, *Trees, *Water management(Applied), *Streams, *Mechanical control, England, Aquatic plants, Shade, Canopy, Fisheries, Sport fishing, Light, Chalk streams, Streamflow, Flood control, Drainage, Vegetation regrowth, Plant growth, Life cycles, Water supply.

Control of aquatic plants in streams (particularly in English chalk streams) by mechanical removal or by shading through planting of trees along the bank is evaluated, and the latter is recommended as a good ecological technique. Trees planted on the north bank will reduce light to a lesser degree than south-bank trees, but will decrease flood risk without reducing the total organic input, including leaf fall. If organic input is already sufficient or excessive, trees should be planted on the south bank to reduce total organic input. The tree line should include gaps to allow for areas of plant growth, which are necessary for fish and invertebrate cover, provide a source of oxygen to the water, and help retain leaf fall evenly. Deciduous trees should be chosen to allow some overwinter growth of aquatic plants and provide a canopy more suitable for machine and dry fly fishing. Costs of tree planting are about the same as plant removal. While plant removal temporarily reduces the risk of flooding, subsequent plant growth is both vigorous and synchronized. Plant growth synchronization causes maximum biomass to coincide over the whole population, and streamflow restriction is actually intensified. In addition, managed streams tend to become trapezoidal channels with only transient patches of sediment, whereas natural streams with stable sediment patches have riffles and pools favorable to fish and invertebrates. Plant removal either earlier in the spring or in late all might achieve better control. (Lynch-Wisconsin)
W79-02012

COPPER SULFATE HELPS CONTROL MICORGANISMS IN RESERVOIRS,
For primary bibliographic entry see Field 5F.
W79-02018

EPA'S CONSTRUCTION GRANTS PROGRAM: PERSPECTIVES COSTS,
Environmental Protection Agency, Washington, DC.
D. M. Costle.
Pollution Engineering, Vol. 10, No. 9, p 40-43, September 1978.

Descriptors: *Grants, *Construction grant program, *Treatment facilities, *Waste water treatment, *Construction costs, *Financing, *Federal Water Pollution Control Amendments of 1977, *Regulation, Environmental Protection Agency, Federal government, Costs, Construction, Legislation, Institutional constraints, Sewage treatment, Waste treatment, Municipal wastes, Operation and maintenance, Tertiary treatment, Economic impact, Local governments, Cost-benefit analysis, Planning, Decision making, Use rate, Policy, Cost-effectiveness.

A description of EPA's construction grants program for waste treatment facilities, emphasizes costs and benefits of advanced waste treatment (AWT) and overall financial impact of the construction program on local communities. A realistic estimate of needs for AWT facilities is $1.5-2.0 billion, covering the cost of plants for total nitrogen removal or achievement of BOD limitations of less than 10 mg/l. A review of 6500 projects shows only 330 will require treatment to achieve these levels. In some cases AWT is mandated by state requirements, but costs of compliance may exceed benefits. The Vertex study, commissioned by EPA, indicated many AWT projects carried out with inadequate planning and justification resulted in excessive expenditures and insufficient compensating benefits. Improved monitoring is needed at the state level. Over 65% of the grants have gone to communities of 10,000 or less, many of which are experiencing financial problems. In 40% of the communities, operation and maintenance plus debt retirement for new facilities will cost over $100/household/year. An expensive treatment system is one in which such costs are 1.5-2.5% of local median income, the case in 10-20% of these communities. Several provisions of the 1977 amendments to the Water Pollution Control Act address these problems, providing more assistance, allowing more flexibility, and removing some of the paperwork. Five of the provisions are discussed. (Lynch-Wisconsin)
W79-02027

OVERSEAS MARKETS FOR THE WATER INDUSTRY - NIGERIA,
M. A. Kershaw.
Effluent and Water Treatment Journal, Vol 18, No 8, p 397-401, August 1978. 8 ref.

Descriptors: *Nigeria, *Marketing, *Water pollution control, *Waste water treatment, *Treatment facilities, *Export, *International trade, *Great Britain, Consulting firms, Engineering, Economics, Economic feasibility, Water supply, Water reuse, Water delivery, Water conservation, Developing countries.

Opportunities for British consulting engineering firms to obtain overseas contracts for water supply, treatment, distribution, conservation, and reuse, wastewater treatment, and water pollution prevention are discussed, with particular reference to Nigeria. Nigeria, under military rule since 1967, is expected to revert to civil government in 1980. Oil production provides almost 95% of foreign exchange, and is expected to last for some 30 years. The cost of the Third Development Program, to be completed in 1980, is estimated at 40 billion U.K. pounds. The project includes water treatment and distribution, sewerage, and wastewater treatment. In most urban centers, the only modern wastewater treatment facilities are located at hospitals, military installations, new universities, and individual factories; many such plants are nonfunctional or functioning poorly, mainly due to lack of trained operators. Major opportunities for foreign firms will be in construction and capital plant. Governments of developing countries typically invite consulting engineers, either directly or through an international agency, to submit a feasibility study, and later a detailed proposal, for acceptance. Useful background information on the prospective country can be obtained from the Ministry of Overseas Development. A senior member of a successful firm may make frequent visits to the country to secure contacts. (Lynch-Wisconsin)
W79-02030

COEFFICIENTS OF POLLUTION: INTERINDUSTRY LINKAGE AND POLLUTION IN BELGIUM,
State Univ. of New York at Binghamton. School of Management.
M. Chatterji.
Environmental Management, Vol. 2, No. 4, p 300-312, July 1978. 11 tab, 8 ref.

Descriptors: *Belgium, *Netherlands, *United States, *Pollution coefficients, *Pollution abatement, *Methodology, Pollutant identification, Analytical techniques, Economics, Environmental economics, Industrial wastes, Input-output analysis, Air pollution, Water pollution, Pollutants, Classification.

A technique is presented for using pollution coefficients derived from data collected in one country for economic analysis of a similar country for which data are unavailable. In this paper data for the Netherlands (Den Hartog and Houweling, 1974) and the United States (Leontief and Ford, 1972) yield pollution coefficients subsequently combined with input-output data prepared for Belgium by the National Institute of Statistics in 1970. Results provide crude estimates of the amount of direct and indirect air and water pollution generated from production of a unit of activity in different sectors of the Belgian economy. With this method considerable data collection expense is avoided, though results clearly are only indications since industrial mix and state-of-technology vary between countries. The input-output data consists of 93 industrial classifications, reduced to 53 in this study. Pollution coefficients obtained for the United States and the Netherlands cannot be directly compared because different pollutant classifications are used. Five pollutant types are identified in the U.S. study: particulates, sulfur oxides, hydrocarbons, carbon monoxide, and nitrogen oxides. The classification for the Netherlands data are: public water pollution, private water pollution, sulfur pollution from gas oil, sulfur pollution from residual oil, solid waste, pollution from automobiles, and pollution from trucks and vans. All coefficients are given in tables. (Lynch-Wisconsin)
W79-02031

THE CHOICE OF EFFICIENT POLLUTION POLICIES: TECHNOLOGY AND ECONOMICS IN THE CONTROL OF SULPHUR DIOXIDE,
London School of Economics and Political Science (England).
A. Marin.
Journal of Environmental Economics and Management, Vol 5, No 1, p 44-62, 1978. 1 tab, 40 ref.

Descriptors: *Regulation, *Sulfur dioxide, *Air pollution, *Pollution abatement, *Technology, Economics, *Pollution taxes(Charges), *Standards, Water pollution control, Damages, Optimization, Emission standards, Monitoring, Heavy metals, Pollutants, Rivers, Input-output analysis, Sulfur, Information.

Reexamination charges vs. regulations for pollution control, with sulfur dioxide as a case study, shows that charges are not always preferable to regulations, and the choice depends on the specific pollutant. Charges would seem more suitable for river pollution than for control of sulfur dioxide--with the exception of initial sewage generation--in terms of several issues: (1) damage functions and optimality, (2) spatial uniformity, (3) number of polluters, (4) monitoring of emissions, (5) relationship between inputs and emissions, and (6) iterations and exactness. Major provisos are problems of monitoring emissions of oxygen-depleting waste, and the necessity of keeping heavy metal contamination of food to acceptable levels. For sulfur dioxide, charges are only practical when levied on the fuel, because of the expense of monitoring emissions and because sulfur inputs equal sulfur dioxide output. Though a tax on fuel sulfur content (with certain exceptions) might be best for reducing all emissions, the inefficiency of attempting this would probably instead lead to a preference for quantitative limits in an effort to achieve acceptable ambient concentrations and to single out worst offenders. This paper presents a technological summary of sulfur dioxide as a pollutant, discusses informational requirements of alternative policies, and compares continuous monitoring with spot checks. (Lynch-Wisconsin)
W79-02038

COORDINATING PUBLIC UTILITY EXPANSION, INDUSTRIAL SITING AND POLLUTION CONTROL: A WORKING DYNAMIC PROGRAMMING ALGORITHM,
California Univ., Riverside. Dept. of Economics.
M. Sheehan, and K. C. Kogiku.
Socio-Economic Planning Sciences, Vol 11, No 6, p 331-338, 1977. 1 fig, 4 tab, 13 ref.

Descriptors: *Algorithms, *Dynamic models, *Public utilities, *Industries, *Pollution abatement, *Wastewater treatment, *Sites, *Planning, Mathematical models, Model studies, Land use, Economic development, Alternative planning, Decision making, Water pollution control, Air pollution, Welfare(Economics), Economics, Computer programs, Sewage treatment, Electric power demand, Trade-offs, Iteration.

A tactical planning method facilitates formulation of a joint plan for public utility capacity management, air and water pollution control, and choice and staging of industrial development in an area. Two mathematically uncomplicated models are linked through an iterative process which obviates computational difficulties usually associated with large-scale dynamic programming formulations. A point system is used in conjunction with data on the estimated impact of the industrial project on municipal and special district revenues, employment, demand for housing, and the like, to yield a measure of gross benefits for each applicant firm. Gross benefits are then combined with utility costs to determine net benefits. Firms violating pollution regulations or having negative net benefits are eliminated, at least temporarily, and a distribution-of-effort algorithm is used to choose among remaining firms. A finite-horizon regenerating model determines the optimal long-run capacity construction plan. An iterative procedure sets the final mix of all components. Use of the method as a fully operational direct planning tool would require centralizing all long-range planning responsibilities into one agency invested with permit power over industrial ingress. Types of required data include: (1) a description of each applicant firm, (2) utility expansion costs, and (3) pollution costs. (Lynch-Wisconsin)
W79-02039

THE LIMITED APPLICABILITY OF MARSHALLIAN ECONOMICS TO THE PROBLEM OF POLLUTION ABATEMENT: A SUGGESTED ALTERNATIVE,
Indiana Univ. at South Bend. Dept. of Economics.
P. Kochanowski, J. G. Witte, and B. Henneberry.
Journal of Economics and Business, Vol 30, No 3, p 219-223, 1978. 1 tab, 12 ref.

Descriptors: *Economics, *Mathematical models, Analytical techniques, Partial equilibrium models, General equilibrium models, *Pollution taxes(Charges), *Regulation, *Pollution abatement, Optimization, Equilibrium, *Model studies, Welfare(Economics), Methodology, Estimation.

Mathematical analysis shows that the partial equilibrium method may result in systematic underestimation of socially optimal effluent charges by as much as 50%. The Marshallian ceteris paribus limits the applicability of partial equilibrium results, especially in the implied neglect of systematic feedbacks on relative output prices and quantities of changes in relative factor prices induced by the charges themselves. This negligibility is demonstrated by applying sensitivity analysis to optimal pollution tax rates determined in the context of a two-sector general equilibrium model. The analysis comprises four steps: (1) marginal conditions derived from a Bergson-type welfare function lead to a general statement of optimal tax rates; (2) optimal tax rates determined with and without impact of the tax on input markets lead to the difference between partial and general equilibrium tax rates as a function of rates of change in prices of capital and labor with respect to the tax; (3) solution for rates of change in prices of capital and labor from a two-sector, two-factor general equilibrium model leads to the difference between partial and general equilibrium tax rates as a function of the characteristics of polluting and nonpolluting sectors, and (4) estimates of these characteristics for the general equilibrium system lead to estimates of the direction and magnitude of the difference between partial and general equilibrium tax rates. Four situations are identified in which Marshallian

and general equilibrium tax rates are identical. (Lynch-Wisconsin)
W79-02041

THE BUSINESS OF POLLUTION CONTROL - A BED OF ROSES OR THORNS.
Pollution Engineering, Vol 10, No 7, p 32-44, 1978. 1 fig, 2 tab.

Descriptors: *Pollution abatement, Equipment, *Technology, *Research and development, *Air pollution, *Water pollution control, Federal Water Pollution Control Act Amendments of 1972, Environmental Protection Agency, Demand, Federal government, Attitudes, Surveys.

Results of a questionnaire sent to 4000 manufacturers of pollution control equipment and components requesting opinions on a variety of topics relating to the industry are presented, and representatives of 20 equipment manufacturers provide personal views on problems of the pollution control market. Several agencies were rated according to their degree of support for pollution control products: EPA was rated by 68% of respondents as helpful and by 32% as not helpful or a hindrance, Commerce Department 51% and 49%, Energy Department 41% and 59%, Interior Department 36% and 64%, President's Council on Environmental Quality 28% and 72%, and H.E.W. 26% and 74%. Respondents considered an average of 45% of their own products as innovative, and companies spend an average of 10.1% of total sales on new equipment research. About 46% of manufacturers believe there will be long term growth in the market, 27% that the market will grow in the short run and then level off, 8% that the market will decline after 1985, and 16% that there will be a change from providing products to providing services. Regarding the best approach to environmental protection, 40% feel a coordinated international approach would be better than the present system; other suggestions include more use of cost-benefit analysis and for EPA to employ personnel who are more technically qualified and less political. About 41-44% feel EPA has stifled new product development or discouraged engineers from trying and specifying new products. (Lynch-Wisconsin)
W79-02044

ECONOMETRIC ANALYSIS OF ENVIRONMENTAL POLICY: ESTIMATION OF A MODEL OF THE CANADIAN PULP AND PAPER INDUSTRY,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 6B.
W79-02046

STABLE TAXATION SCHEMES IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Centro Teoria dei Sistemi, Milan (Italy).
S. Rinaldi, R. Soncini-Sessa, and A. B. Whinston.
International Institute for Applied System Analysis, Luxemburg, Research Report 77-10, May 1977. 45 p, 9 fig, 7 ref, 1 append.

Descriptors: *Pollution taxes(Charges), *Economics, *Pollution abatement, *Water pollution control, *Stability, *Economic efficiency, *Regional economics, *River basins, Water management(Applied), Externalities, Model studies, Mathematical models, Game theory, Water quality standards, Optimization, Cost-benefit analysis, Damages, Waste water treatment, Waste water disposal, Effluents, Institutional constraints, Political constraints, Economies of scale, Damage functions, Public benefits.

Simple game theory is used to analyze the stability and efficiency of regional pollution tax schemes, focusing on water pollution control in a river basin. Stability (where users have no incentive to reject the plan) and efficiency can be attained by permitting the regional authority to sell emission rights for profit, with higher profit necessary with increasing environmental congestion. In the absence of profit, social benefits cannot be maximized without generating friction among the polluters. Efficiency and stability are easily attainable if environmental damage is ignored, that is, if total benefit of firms rather than social benefit is maximized. Such a situation, which has characterized the course of industrialization throughout the world during the past century, is no longer tolerable. Three classes of abatement schemes are evaluated: (1) Effluent standards are imposed by law on each firm, and wastewater treatment is handled by a regional authority with cost recovery through apportionment of costs among users based on residuals of each firm. (2) Pollutant removal standards are legally imposed, with taxes on waste production. (3) Effluent charges are levied; stable taxation schemes only exist where firms realize high profits. The analytical model considers two basic institutional arrangements, treatment plants owned and operated by producers, or plants operated by a regional authority. (Lynch-Wisconsin)
W79-02051

NATURAL RESOURCES AND ENVIRONMENTAL RESTRICTIONS TO GROWTH,
Harvard Univ., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W79-02056

PRICING AND STANDARDS IN THE CONTROL OF POLLUTION,
York Univ. (England).
M. Ricketts, and M. G. Webb.
Scandinavian Journal of Economics, Vol 80, No. 1, p 53-61, 1978. 2 fig, 6 ref.

Descriptors: *Pricing, *Standards, *Pollution taxes(Charges), *Regulation, *Timing, Policy, Air pollution, Water pollution control, Governments, Costs, Marginal costs, Model studies, Mathematical models, Political constraints, Optimization.

Where a government wishes to control the timing as well as the standards of pollution abatement, and where costs are influenced by both abatement level and timing, no single tax may produce a politically acceptable outcome. To achieve the latter (at least cost) may require a complex tax structure. In certain circumstances, however, the combination of a central directive requiring abatement by a given date and a single Baumol-Oates type of post-abatement would lead to efficient results with a simpler structure. The analysis is based on the observation that: (1) the choice of a particular tax rate on emissions determines not only the abatement level but also the time of abatement, and (2) setting the optimal tax at a level equal to an industry's long-run marginal costs of abatement raises the question of which long-run marginal cost function is relevant. The model used assumes that society has determined the acceptable abatement standards and time limits. Other conclusions are that: (1) where different firms have unequal abatement cost functions the tax solution requires that a different tax rate be applied to every firm; and (2) the relevant concept of the long-run relates to the acceptable level of delay, and the optimal tax should be imposed after this time has elapsed. (Lynch-Wisconsin)
W79-02057

A POLLUTED GOLDEN AGE,
Chicago Univ., IL.
W. A. Brock.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 441-461, 1977. 21 ref.

Descriptors: *Economics, *Economic growth, *Pollution abatement, *Mathematical models, *Club of Rome, Costs, Equilibrium, Model studies, Cost-benefit analysis, Capital, Externalities, Interest rates, Optimization, Utility, Pollution taxes(Charges), Marginal costs, Discount rates.

An economic growth model is presented which includes pollution costs, and its use in analyzing current environmental issues is demonstrated regarding the Club of Rome report. The report basically contends that continuation of population growth, pollution productions, and energy consumption at current or even lower rates will essentially cause society to collapse. Critics argue that the report ignores the role of the price system in holding down energy usage. This paper discusses: (1) the model; (2) how growth theory relates to equilibrium theory, with emphasis on externality taxes; (3) biases in the observed market rate of interest when pollution is accounted for (important in discounting future benefits in cost-benefit analysis); and (4) use of such models in building a theoretical apparatus for discussion of issues raised in the Club of Rome report, focusing on whether free enterprise has a self-corrective mechanism to avoid a development vs. pollution catastrophe. It is shown that if a pollution tax is set equal to the marginal social cost of polluting, then competitive equilibrium internalizes the externality which produces the optimal amount of goods and pollution. (Lynch-Wisconsin)
W79-02071

OPTIMAL CONFIGURATION OF THE COOLING SYSTEM FOR POWER GENERATION,
Kansas Water Resources Research Inst., Manhattan; and Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
L. T. Fan, S. H. Lin, R. Shojalashkari, and C. L. Hwang.
Contribution No. 149. In: Energy Sources, Vol. 1, No. 4, p 401-422. 1974. 10 fig, 17 ref. OWRT B-037-KAN(4), 14-31-0001-4086.

Descriptors: *Cooling towers, Water pollution control, Investment, System synthesis, *Optimal cooling systems, *Power generation, *Cooling ponds, Direct discharge subsystem, Structural parameter method, Generalized reduced gradient method.

The purpose was to apply a system-synthesis technique to the determination of the optimal cooling system for power generation. The cooling system was assumed to consist of a cooling tower, a cooling pond, and a direct-discharge subsystem. The optimal cooling system was determined in light of minimizng the total capital investment requirement of the whole system and satisfying the temperature-rise constraint imposed on the cooling-system output. The structural-parameter method, in conjunction with the generalized reduced-gradient (GRG) method, was employed to optimally synthesize the cooling system. Under the assumptions made, the cooling tower and the cooling pond should not be connected in series.
W79-02081

WATER QUALITY CAN AFFECT MANAGEMENT PLANNING,
R. Ross.
Irrigation Age, Vol. 12, No. 1, p 60, 63, September, 1977. 1 fig.

Descriptors: Sodium, *Salt, *Saline water, Soils, *Irrigation, Irrigation effects, Irrigation practices, *Water quality, Water management(Applied).

Over a period of time, particularly on a fine-textured soil, a high concentration of sodium could change the character of the soil so that water could no longer penetrate it. A large amount of total salts could cause an 'artificial drought.' High sodium and/or too much total salts are among the primary reasons that irrigation water which may appear to be fine may, in face, be of poor quality. (Skogerboe-Colorado State)
W79-02096

CONTROLLING SEDIMENT IN SURFACE RUNOFF,
Agricultural Research Service, Kimberly ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W79-02097

THE OCCURRENCE AND REMOVAL OF NITROGEN IN SUBSURFACE AGRICULTURAL DRAINAGE FROM THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Dept. of Water Resources, Sacramento.

R. L. Brown.
Water Research Vol. 9, No. 5/6, p 529-546, May/June 1975. 11 fig, 7 tab, 39 ref.

Descriptors: *Drainage, *Drainage effects, *Water treatment, *California, *Nitrogen, Waste water treatment, Water pollution, Return flow, *San Joaquin Valley(Calif).

During the years 1967-1973 there have been extensive studies of subsurface agricultural drainage in the San Joaquin Valley of California. These studies, by cooperating state and federal agencies, were to determine the composition and quantity of drainage waters produced from irrigated agriculture, to evaluate possible methods of removing problem constituents (mainly nitrogen) from these waters, and to obtain an idea of the effectiveness of the treatment methods studied for reducing the waters' biostimulatory content with respect to potential receiving waters. (Skogerboe-Colo St)
W79-02107

ESTIMATES OF 7-DAY, 10-YEAR MINIMUM FLOWS AT SELECTED STREAM SITES IN PUERTO RICO,
Geological Survey, San Juan, PR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02125

SOURCE ASSESSMENT: WATER POLLUTANTS FROM COAL STORAGE AREAS,
Monsanto Research Corp., Dayton, OH.
For primary bibliographic entry see Field 5B.
W79-02144

RESEARCH ON CONTROL TECHNOLOGY FOR ICE FOG FROM MOBILE SOURCES,
Environmental Protection Agency, College, AK. Alaska Water Lab.
H. J. Coutts, and R. K. Turner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 611, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-055, May 1978. 98 p, 27 fig, 3 tab, 14 ref, 4 append.

Descriptors: *Ice fog, *Automotive emissions, *Heat exchangers, *Air pollution effects, *Pollution control devices, *Cold regions, Mist, Pollution abatement, Pollutant identification, Condensation, Water vapor, Condensers.

Ice fog is a form of air pollution caused by the release of water vapor into air too cold to hold the water in vapor form. The vapor condenses into ice particles, which severely restrict visibility during extremely difficult driving conditions in subarctic areas, such as Alaska. The three major sources of ice fog are automotive and truck exhausts; open water surfaces, such as cooling ponds; and exhaust gases from heating and electrical powerplants. Research was conducted during the 1974-75 and 1975-76 winters, to determine and evaluate methods of reducing automotive generated ice fog. The major technique evaluated was removing the water vapor as a liquid condensate using cooler-condensers. These devices are heat exchangers in which the exhaust gas is cooled by cold ambient air or coolant from the automobile radiator. It was found that when using the cooler-condensers only, much of the condensed water formed a mist; therefore, use of coalescers was necessary to transform the mist into water. As on-the-road performance of a cooler-condenser equipped vehicle revealed that 81% of the overall water vapor was condensed at an ambient temperature of -16F. Estimations are that 50% of the ground level ice fog is generated by automotive sources, and that if ice fog control devices yielding an 80% reduction were used, vehicle ice fog emissions would be reduced approximately 40%. (Davison-IPA)
W79-02147

COMBINATION LIMESTONE-LIME NEUTRALIZATION OF FERROUS IRON ACID MINE DRAINAGE,
Industrial Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W79-02150

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-02152

EFFECT OF ANTIMYCIN ON STREAM INSECTS IN FIELD AND LABORATORY TRIALS,
Wisconsin Univ.-Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-02156

INCREASING EFFICIENCY OF AQUATIC PLANT MANAGEMENT THROUGH PROCESSING,
Wisconsin Univ.-Madison. Water Resources Center.
For primary bibliographic entry see Field 4A.
W79-02158

PROCEEDINGS OF THE INTERSTATE SEAFOOD SEMINAR OCTOBER 4-7, 1977.
Virginia Polytechnic Inst. and State Univ., Hampton. Dept. of Food Science and Technology.
Virginia Polytechnic Institute and State University Sea Grant Publication, (1978). 287 p. W. R. Hess, Jr. (ed.).

Descriptors: *Food processing, *Shellfish, *Pollution abatement, *Toxicity, Water quality, Seafood, Aquaculture, Wastes, Water pollution control, *Coastal zone management, Estuarine management, Sanitary control, Ocean dumping.

An edited version is presented of the proceedings of the Interstate Seafood Seminar held in October 1977. Changes were made in the transcripts to turn oral delivery into a written publication. The larger purpose of the seminar was to improve the shellfish and crab meat sanitary control program, yet many of the presentations dealt with the biology, ecology, and nutritional value of specific shellfish. (NOAA)
W79-02163

SURFACE WATER VS. GROUND WATER,
National Water Well Associaton, Worthington, OH.
For primary bibliographic entry see Field 4B.
W79-02176

INNOVATIVE WATER SYSTEM SOLVES QUALITY PROBLEM,
Tacoma Dept. of Public Utilities, WA. Water Div.
J. A. Roller, and W. N. Moline.
Water and Sewage Works, Vol. 125, No. 11, p 70-73, November, 1978. 2 fig.

Descriptors: *Conjunctive use, *Water supply, *Turbidity, Water quality telemetry, Remote control.

Tacoma's principal water source, the Green River, has excessive turbidity in the late winter and early spring. At such times it is necessary to augment this supply with ground water from the North Fork well field, one of the most productive in the world. The six production wells have a total yield of 72 MGD with comparatively little drawdown. Six Byron Jackson submersible pumps, each with a capacity of 8,333 Gpm, were installed. From the North Fork wells, water is piped 7 miles to a 10 MG storage tank. When turbidity occurs in the Green River the river water is blended with well water from the storage tank to reduce turbidity to acceptable limits. The water-blending operation is controlled by two upstream turbidometers that continuously sample the river. Communications between the automated components of the pumping and blending systems are controlled by a solar-powered microwave relay station. When water from the storage tank is injected into the system on signal from the turbidity sensors, it will hydraulically block some or all of the river water, depending on how many blending valves are opened. (Purdin-NWWA)
W79-02183

UNDERGROUND INJECTION CONTROL PROGRAM STUDIED,
D. Webster.
Drill Bit, Vol. 27, No. 11, p 27, November, 1978

Descriptors: *Injection, *Oil industry, *Water pollution, State governments, Administrative agencies, Environmental protection agency, Water flooding, Waste disposal wells

At the annual meeting of the New Mexico Oil and Gas Association, Joe Raney, director of the state's Oil Conservation Division reported that ground water contamination from injection programs appears to be diminishing in Lea County but increasing in nearby Eddy County. However, there is not as much fresh water in the affected areas of Eddy County so the contamination potential is not as great. The state of New Mexico, in collaboration with the Federal Environmental Protection Agency, will soon be making an inventory of an estimated 16,000 oil field pits in the state. The EPA will also attempt to inventory all injection wells in the state. A recommendation will be made to the state legislature that the New Mexico Oil Conservation Commission be abolished and that the director of the state's Oil Conservation Division take over the responsibility of presiding over hearings. (Purdin-NWWA)
W79-02184

DREDGE SPOIL IN MISSISSIPPI SOUND,
University of Southern Mississippi, Hattiesburg.
For primary bibliographic entry see Field 5E.
W79-02188

PLANNING FOR OFFSHORE OIL DEVELOPMENT, GULF OF ALASKA OCS HANDBOOK,
Alaska Dept. of Community and Regional Affairs, Juneau. Div. of Community Planning.
L. S. Kramer, V. C. Clark, and G. J. Cannelos.
1978. 271 p.

Descriptors: *Alaska, *Resource development, Planning, *Oil industry, Exploration, Water quality control, Pollution abatement, Baseline studies, Environmental effects, Leases, Industrial production, *Outer Continental Shelf, Gulf of Alaska, Petroleum development.

The basic State policy framework within which the orderly search for offshore oil resources in the Gulf of Alaska and off Kodiak Island can proceed, is presented. This handbook provides information about the basic operations and planning requirements of the offshore industries. The purpose of the book is to clarify the nature of outer continental shelf (OCS) oil and gas activity in the waters off Alaska and to spell out what it will mean to all Alaskans, particularly to people in coastal communities directly involved. The book sets forth the State's policies on OCS development, encouraging cooperation and coordination of effort among local governments and state agencies so that related onshore activities will confer the most benefit and the least harm. (NOAA)
W79-02198

OXYGEN TRANSFER AT HYDRAULIC STRUCTURES.
Watson (J. D. and D. M.). London (England).
S. T. Avery, and P. Novak
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14190, p 1521-1540, November 1978. 8 fig, 4 tab, 35 ref, 2 append

Descriptors: *Air entrainment, *Dissolved oxygen, *Oxidation, Laboratory tests, Model studies, Mathematical models, Hydraulic structures, Weirs, Jets, Spillways, Rivers, Water quality, Oxygen, Water pollution, Sewage, Turbulence, Hydraulic jump, Hydraulics, Hydraulic engineering.

The shortcomings of existing equations for the prediction of oxygen transfer at hydraulic structures were illustrated, particularly with reference to free overall weirs. The effect of all important hydraulic variables was reviewed together with water quality effects, in particular the effect of dissolved salts. Modelling according to the Froude law of similarity, the oxygen transfer expressed as a deficit ratio, was shown to vary as a simplified function of the scale. Equations were submitted describing the oxygen transfer in an hydraulic jump and at a free overfall weir. The lattr equation was shown to correlate successfully both model studies and measurements at a number of prototype structures; and, further, the application of the equation to a variety of situations such as spillway jets, multiple jet weirs and cascade of pools was described. An equation to estimate the optimum pool conditions for oxygen transfer was presented. (Sims-ISWS)
W79-02202

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 656, Price codes: A06 in paper copy, A01 in microfiche. Report No. AER 75-76 WRW-1, October 1975. 107 p, 22 fig, 12 tab, 33 ref. NSF GK 42122.

Descriptors: *Water pollution sources, *Agriculture, *Agricultural runoff, *Pollution taxes(Charges), *Colorado River, Water pollution, Salts, Salinity, Leaching, Irrigation, Evapotranspiration, Water quality, Model studies, Mathematical models, Economics, Hydrology, Geology, Taxes, *Nonpoint water pollution sources, Irrigation return flow.

A methodology for taxing diffuse agricultural pollution sources was presented. The methodology is based upon deriving linkages between 3 economic and hydrologic modeling systems. The procedure involves modeling the hydro-quality system in the agricultural area in order to identify the specific processes causing water quality degradation. Then, these results are linked through a pollution coefficient to an economic externalities model describing the detriments incurred by downstream uses of water with poor quality characteristcs. An input-output model was developed from which input coefficients and business multipliers were calculated as a means of assessing the local economic impact of alternative taxing policies. The Grand Valley in Western Colorado was taken as the case study for this project since it is one of the more significant sources of salinity in the Colorado River Basin. The analysis evaluated the potential for taxing agricultural croplands in the valley as a means of controlling salinity-related damages in the lower Colorado River Basin. Four groups of taxing strategies were investigated: (1) directly attributable detriments, (2) per acre equivalent salt loading, (3) salinity or pollution coefficients, and (4) values of gross revenue per acre. A discussion of how each tax could be applied was presented. (Sims-ISWS)
W79-02219

ENVIRONMENTAL IMPACT ASSESSMENT: AN AQUATIC BIOLOGIST'S POINT OF VIEW,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 6G.
W79-02222

WIND INDUCED DISPERSION AND ALGAL GROWTH IN SHALLOW LAKES,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering.
F. A. DiGiano, L. Lijklema, and G. Van Straten.
Ecological Modelling, Vol. 4, No. 2-3, p 237-252, 1978. 7 fig, 2 tab, 7 ref.

Descriptors: *Winds, *Dispersion, *Algae, *Lake Brielle(Neth), *Sedimentation, *Mathematical models, Model studies, Tracers, Lakes, Shallow water, Plant growth, Euphotic zone, Darkness, Netherlands, Eutrophication, Light, Limiting factors, Phosphates, Cycling nutrients.

A simple two-compartment model consisting of euphotic and dark zones, to show effects of dispersion and sedimentation on algal growth and phosphate cycling in shallow lakes, is demonstrated for Lake Brielle, Netherlands. Results are compared to those of a multi-layer finite-difference model which more accurately represents algal concentration gradients. Simulation suggests that algal growth occurs more rapidly in calm weather when wind-induced dispersion is negligible. Dispersion may influence the rate of particulate phosphate accumulation in sediment due to settling out of algal cells, and may also influence the soluble phosphate profile in the overlying water column. A tracer technique was used in Lake Brielle to measure dispersion caused by a moderate wind of 4 m/sec; results ranging 4-6 sq cm/sec compared well with predictions. The two models agreed well in predictions of average algal concentrations in euphotic and dark zones with dispersion rates of 0-6 sq cm/sec and sedimentation rate constants of 0.002-0.02 m/hr. Simulated wind-induced dispersion of only 1 sq cm/sec greatly suppressed algal growth in the euphotic zone; a higher sedimentation constant likewise restricted algal growth, even more pronounced with the inclusion of dispersion. It is uncertain whether dispersion values of 0 sq cm/sec actually occur during calm weather. (Lynch-Wisconsin)
W79-02226

BEST MANAGEMENT PRACTICES TO CONTROL NONPOINT-SOURCE POLLUTION FROM AGRICULTURE,
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
J. A. Krivak.
Journal of Soil and Water Conservation, Vol. 33, No. 4, p 161-166, 1978. 3 tab, 8 ref.

Descriptors: *Nonpoint pollution, Agriculture, *Water pollution control, *Best management practices, *Crop production, *Livestock, Federal Water Pollution Control Act Amendments of 1972, Clean Water Act of 1977, Irrigation, Feedlots, Pasture management, Pollutant identification, Pollutants, Salts, Nutrients, Soil erosion, Soil conservation, Pesticides, Organic matter, Pathogenic bacteria, Thermal pollution, Grazing, Agricultural runoff, Cultivation.

Provisions of the Federal Water Pollution Control Act Amendments of 1972 and the Clean Water Act of 1972 requiring and facilitating implementation of best management practices (BMPs) for control of nonpoint water pollution sources are briefly described, and their relationship to agriculture is discussed. The 1977 legislation provides management and resource assistance needed to accelerate rural water quality management programs. Pollutants resulting from nonirrigated crop production include sediment, nutrients, pesticides, and organic matter. Application of irrigating cropland increases the likelihood of runoff and resultant pollution from salts, sediment, and sediment-related pollutants. Confined animal production facilities generate pollution from nutrients, organics, sediment, salts, pesticides, and pathogens. Animals on pasture or range can generate excessive sediment, nutrients, organic matter, and pathogens through elimination of protective vegetation caused by overgrazing. BMPs represent a pollution preventive; this report describes several of them. BMPs for erosion and sediment control on croplan include tillage measures, management of surface and vegetative covers, and soil and water conservation. Techniques for preventing loss of nutrients and pesticides generally involve proper application, optimum dosage, timing, and disposal of unused chemicals and containers. Prevention of overgrazing involves evaluation of the land's forage capacity, animal grazing habits, soil characteristics and slope. (Lynch-Wisconsin)
W79-02233

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE, AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
R. S. Farnham, and D. H. Boelter.
In: A National Symposium on Freshwater Wetlands and Sewage Effluent Disposal, May 10-11, 1976, Ann Arbor, Michigan, University of Michigan, p 241-255, 12 ref.

Descriptors: *Peat, Hydrology, *Biological treatment, Crops, Waste water treatment, Nutrient removal, Fuels Soil amendments, Wetlands, Minnesota, *Peatlands, *Sewage treatment.

The most unique type of freshwater wetland in Minnesota is the 3 million ha of peatland. The hydrologic role of peatlands may not be as significant as once thought. Rather than soaking up snowmelt and early spring rains and gradually releasing runoff through the summer, peatlands often play a less significant role in the seasonal distribution of runoff with a large portion of the annual flow occurring prior to June 15. Drained and fertilized, these organic soils are productive for both field and forest crops, especially vegetable, seed, and forage crops, wild rice,, and other specialty crops. Peat is useful as a soil amendment or as a horticultural medium for plant growth. The relatively high caloric values of peat have led to its use as fuel in Europe and similar potentials exist in Minnesota. Renovation of waste waters is quite good using a combination of the filtering and absorbing action of peat and the harvest of plants growing on the filter beds for assimulation and remova of nutrients. (Stihler-Mass)
W79-02255

PROGRESS REPOT ON MOSQUITOE RESEARCH: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Entomology and Nematology; and Florida Univ., Gainesville. Center for Wetlands.
H. Davis.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 684-706, 1976. 12 fig, 2 tab.

Descriptors: *Swamps, *Water pollution control, *Mosquitoes, *Diptera, Wetlands, Florida, Waste water disposal, Aquatic insects, Diseases, Animal diseases, Water levels.

With the exception of a few species, most of the mosquitoes associated with the cypress swamps in northcentral Florida are not avid human blood feeders; however, two exceptions, Aedes infirmatus and Aedes atlanticus, are extremely annoying human pests. Both species are abundant in cypress swamps in which levels of standing water fluctuate seasonally. By adding sewage effluent, water levels in two swamps have been maintained at fairly constant levels throughout the summer. This has greatly reduced the numbers of these floodwater species that are breeding at the margins of these domes. Although the stable water level and extensive duckweed cover have caused a reduction in the available mosquito breeding area within the domes receiving effluent, six species are still abundant. Sentinel bird studies have shown that encephalitis is present in all of the five cypress domes sampled (two sewage and three control domes) Peak encephalitis activity occurred in late June and early July, coinciding with peak mosquito activity. No virus activity has been observed in areas outside the domes. In the early spring, the most annoying insect pest in these swamps is not a mosquito but the tabanid, Diachlorus ferrugatus, the yellow fly. (See also W79-02256) (Steiner-Mass)
W79-02281

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 6B.
W79-02288

PRELIMINARY EVALUATION OF FINAL CUT LAKES,
Illinois State Water Survey, Urbana.
J. P. Gibb, and R. L. Evans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 954, Price codes: A05 in paper copy, A01 in microfiche. Circular 130, 1978. 88 p, 41 fig, 39 tab, 15 ref, 1 append.

Descriptors: *Lakes, *Strip mines, *Strip mine lakes, *Water quality, Water resources, *Illinois, Pollutants, Water pollution, Chemicals, Sediments, Dissolved solids, Heavy metals, Hardness(Water), Dissolved oxygen, Hydrogen ion concentration, Water supply, Irrigation, Irrigation water, Surface waters, Stock water, Water sources, On-site investigations, Final cut lakes.

Twelve representative final cut impoundments were selected and studied to determine their volumes and estimated yield potentials. The volumes range from 97 to 3488 acre-feet and average 812 acre-feet. Estimated yield potentials at a 2-year recurrence interval range from 0.15 to 3.98 million gallons per day and average 0.86 million gallons per day. Projections of these estimates to lakes inventoried through June 30, 1971, were made and presented as county totals. The potential water supply from final cut impoundments for the 40 surface mining counties in Illinois ranges from 0 to 75.66 mgd. For 10 counties the estimated yield potential from final cut impoundments exceeds the estimated 2020 water demands. Based on published water quality requirements and data collected during this study, only 2 of the 12 lakes studied have water quality suitable as a source for public water supply. Three are suitable for irrigation, and all 12 are suitable for livestock watering. However, the quality of water from these impoundments is treatable and often comparable to the quality of alternative water sources. Each lake should be evaluated more closely in terms of yield, quality, and the economics of development as compared with other available water resources. (Sims-ISWS)
W79-02292

OIL SORBING MAT,
A. P. Lorentzen.
U.S. Patent No. 4,107,051, 4 fig, 3 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1252, August 15, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, Absorption, Water quality control, Oil sorbing mat, Fibrillated film.

An oil sorbing mat comprises sections of expanded fibrillated film assembled into a flexible resilient handleable and integral structure in which the sections are juxtaposed, with openings in the juxtaposed sections overlapped to establish a network of interstices into which oil can be received and stored. Fibrillated film means film that has been formed with a myriad number of generally parallel cuts closely spaced on an axis transverse to the direction of the cuts and staggered along longitudinal axis so as to leave an integral structure that may be expended, i.e. stretched transverse to the direction of the cuts, to form a lightweight net-like structure. Conventionally, after a film has been fibrillated it is twisted into a twine or rope. In this invention it is used in an expanded form in which the transverse width of the film is at least twice the transverse width of the film prior to fibrillation.
W79-02309

OIL SALVAGER,
S. Macaluso.
U.S. Patent No. 4,108,773, 9 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 4, p 1820-1821, August 22, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water quality control, *Water pollution treatment, Separation techniques, Skimming, Gravity separation, Oil recovery, Catamarans.

An oil salvage intensity separation chamber is mounted between the pontoons of a catamaran type vessel. A positionable scoop directs a contaminent, such as oil, floating on a body of water into an inlet opening provided in the lower portion of the chamber; while a deflector directs the oil up into the column of sea-water. A sea-water opening is provided in the lower portion of the chamber, with a set of valves and a pump to facilitate accumulating the column of sea-water in the chamber. An oil outlet and pump are provided in the upper portion of the chamber to draw off the separated oil which may be pumped through a suitable conduit to a collecting facility such as a barge. As the catamaran type vessel moves, the oil contaminated sea-water moves into the chamber and because of its lighter density the oil in globs or globlets floats up through the column of sea-water into a layer floating on top of the sea-water column. (Sinha-OEIS)
W79-02315

FRESH WATER SUPPLY AND WASTE WATER RETENTION SYSTEM,
CAF Industries, Phoenix, AZ. (Asignee).
R. E. Reed.
U.S. Patent No. 4,109,604, 7 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 973, No. 5, p 2106, August 29, 1978.

Descriptors: *Patents, *Water storage, *Waste storage, Water pollution control, Pollution abatement, Recreation, Water quality control, Recreational vehicles.

A fresh water supply and waste water retention systems is incorporated within a floating carrier for transporting land based recreational vehicles on a body of water. The system includes one or more fresh water containers and one or more waste water containers, all of which are symmetrically placed about a selected lateral axis of the carrier. The system permits the transfer of water from the fresh water containers into the waste water containers without affecting the center of gravity of either the fresh water supply and waste water retention system or the center of gravity of the floating carrier/-recreational vehicle combination. (Sinha-OEIS)
W79-02317

COMPOSITIONS AND PROCESSES FOR THE DISPERSING OF OIL SPILLAGES,
Lanko Chemicals Group Ltd., MAnchester (England). (Assignee).
D. J. Tennant, P. Sheridan, and A. J. Steel.
U.S. Patent No. 4,110,213, 7 p, 6 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2310, August 29, 1978.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution treatment, Water quality control, *Dispersion, Toxicity, Emulsions, Chemical reactions.

This invention provides compositions and processes for the dispersing of spilled oil, wherein the compositions are substantially non-toxic, to marine life or, at least less toxic than the prior art compositions, may generally be diluted with sea water without gelation (or increase in viscosity), are efficient in dispersing the spilled oil, are of a relatively concentrated nature, and are substantially free from fire hazard. The concentrate for use in the dispersion of oil spillages is substantially free from hydrocarbon solvent and comprises from 20 to 75% by weight of an emulsifying agent, which is a mono-ester of an aliphatic carboxylic acid and a polyoxy-alkylene glycol. The concentrate is physically and chemically stable to a wide range of temperatures, and may easily be diluted with water, especially sea-water, immediately prior to application. (Sinha-OEIS)
W79-02325

APPARATUS FOR COLLECTING DEBRIS FLOATING IN A STREAM,
A. L. Wagnon, and A. J. Janoulis.
U.S. Patent No. 4,110,216, 5 p, 5 fig, 20 ref; Official Gazette of the United States patent Office, Vol 973, no 5, p 2312, August 29, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Streams, Running water, Storm runoff, Equipment, Debris collection.

An apparatus is provided for collecting debris floating in a stream and the apparatus in one form may comprise a collector placed astride the stream with a first part arranged to engage and intercept floating debris. Another part is pivotally mounted downstream from the first part and above the surface of the stream. Lift means secured to the collector adjacent the first part controls the elevation of the first part in accordance with variations in the level of water in the stream. (Sinha - OEIS)
W79-02328

FILRATION SYSTEM,
Canplan Filtration Ltd., Halifax (Nova Scotia)
For primary bibliographic entry see Field 5D
W79-02332

GRAVITATIONAL SEPARATOR FOR MIXTURES OF IMMISCIBLE LIQUIDS OF DIFFERENT DENSITIES,
National Marine Service, Inc., St. Louis, MO. (Assignee)
For primary bibliographic entry see Field 5D
W79-02336

DEVICE FOR THE REMOVAL OF A LIQUID LAYER ON WATER,
Societe Generale de Constructions Electriques et Mecaniques Alsthom, Paris (France). (Assignee)
J. Pichon
U.S. Patent No. 4,111,809, 9 p, 5 fig, 22 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 331, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Equipment, Separation techniques, Centrifugation, *Flotation, Oil collection, Suction.

The floating apparatus comprises a cyclone carrying a normally submerged dam forming with the body of the cyclone a water compartment containing the cyclone inlet orifice. The sill of the dam is situated below but close to the free surface of the body of water from which the pollutant is to be removed and such sill is formed to create a continuous flow of water and pollutant into the compartment to form a level of the mixture lower than that of the free surface of the body of water. The dam has a height enabling the level of water in the compartment to be maintained constantly higher than the inlet orifice of the cyclone. Suction means are connected to the lower outlet for filling the cyclone up to its ceiling with the liquid mixture from the compartment. A cyclonic rotation is produced capable of separating the water and pollutant by centrifugation and concentrating the pollutant in an axial central zone of the cyclone, and for removing the water freed from the pollutant through the lower outlet of the cyclone. Another suction means removes the separated concentrated pollutant through the ceiling of the cyclone. Means are provided to adjust the inlet flow of the cyclone so as to maintain the level of the mixture in the compartment at a constant height. (Sinha-OEIS)
W79-02337

APPARATUS FOR COLLECTING EFFLUENT OIL,
Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
S. Fukuda, Y. Seiki, M. Iizuka, H. Kasai, and M Enami.
U.S. Patent No. 4,111,811, 12 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 331-332, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, Water quality control, Weirs, Equipment, Oil collection, Suction.

An improved apparatus for collecting effluent oil floating on a water surface utilizes a pair of side plates placed in a forwardly opened arrangement, a weir which is inclined in a rear-downward direction with its opposite side edges contacted to the inner wall surfaces of the side plates under the water surface, and a slant plate which as its rear end positioned above the rear end of the weir and has its opposite side edges secured to the inner wall surfaces of the side plates. An oil leakage preventing plate is positioned midway between the rear end of the weir and the read end of the slat plate and is secured to the inner wall surfaces of the side plates to form a water discharge port and an oily water intake port between the oil leakage preventing plate and the rear end of the slant plate. The oily water intake pipe is connected with the oil water intake port and a float is mounted to the side plates. In addition, wave buffering chambers are positioned above the slant plate and the intake port to help absorb the kinetic energy of wave action forced against the intake port. (Sinha-OEIS)
W79-02339

PERIMETER DIKE RAISING WITH DEWATERED FINE-GRAINED DREDGED MATERIAL AT UPPER POLECAT BAY DISPOSAL AREA, MOBILE, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W79-02345

ABILITY OF SALT MARSHES TO REMOVE NUTRIENTS AND HEAVY METALS FROM DREDGED MATERIAL DISPOSA AREA EFFLUENTS,
For primary bibliographic entry see Field 5E.
W79-02347

POSSIBILITY OF RENDERING BLEACHERY EFFLUENTS HARMLESS BY TECHNOLOGICAL CHANGES (UEBER DIE MOEGLICHKEIT BLEICHEREIABWAESSER DURCH TECHNOLOGISCHE AENDERUNGEN UNSCHAEDLICH ZU MACHEN),
Vyskumny Ustav Papieru a Celulozy Bratislava (Czechoslovakia). Forschungsinstitut fuer Zellstoff Und Papier.
J. Schmied, and J. Gajdos.
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 10, p 375-378, May 31, 1978. 5 fig, 9 ref.

Descriptors: *Bleaching wastes, *Water pollution control, *Sulfite pulp mills, *Water reuse, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Ammonia, Sodium compounds, Magnesium compounds, Lignins, Chlorine, Pulp wastes, Pulp washing, Closed systems, Sodium hydroxide, Magnesium chloride, Chlorine dioxide, Water conservation.

The possibility of closing the water circuit of a sulfite pulp mill, specifically by circulating the bleachery effluent back to unbleached pulp washing and then to chemical recovery, is particularly applicable to magnesium bisulfite pulping. Points relating to the success of such operation include pulping to low kappa number, substitution of chlorine dioxide for liquid chlorine in chlorination, use of ammonia instead of NaOH in the extraction stage, effect of magnesium chloride on the reaction of lignin with chlorine and chlorine dioxide, and the optimal use of chlorine dixoide in bleaching to various degrees of whiteness. (Ward-IPC)
W79-02360

POSSIBILITIES AND MEASURES IN THE PULP INDUSTRY IN THE INTEREST OF ENVIRONMENTAL PROTECTION (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES).
Umweltschutz, Vol. 14, No. 12, p 302, 304-310, 1977.

Descriptors: *Pulp and paper industry, *Water pollution control, *Austria, *Air pollution control, Foreign countries, Europe, Pulp wastes, Bleaching wastes, Water pollution sources, Sulfite pulp mills, Kraft mills.

This is a general review of the pollution control program of the Austrian pulp industry. Research and development in the area of reducing and treating sulfite and sulfate (kraft) pulping effluents and pulp bleaching effluents and controlling sulfite and sulfate mill air pollution are reviewed. Recent pollution control measures taken at specific Austrian mills are outlined. (Speckhard-IPC)
W79-02369

PULP INDUSTRY AND WATER POLLUTION CONTROL (ZELLSTOFFINDUSTRIE UND GEWAESSERSCHUTZ),
H. Fleckseder.
Umweltschurz, Vol. 14, No. 12, p 288-293, 1977. 4 fig, 1 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, *Sulfite pulp mills, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Chemical oxygen demand, Biochemical oxygen demand, Carbon, Water pollution, Bleaching wastes, Sulfite liquors, Neutralization, Waste water treatment, Waste treatment, Water pollution treatment, Filtration, Flotation, Sedimentation, Condensates.

COD, BOD, and total organic carbon (TOC) are discussed as indices for describing the level of pollution of pulp mill waste waters, and process measures for reducing the pollution load of such waste waters are reviewed. The pollution load of a magnesium-base sulfite pulp mill is compared to that of a calcium-base sulfite pulp mill. It is shown that BOD can be reduced to about 20 kg/ton of pulp and COD to about 50 kg/ton of pulp at 99% liquor recovery in a system where 70% of the organic load from bleaching is combined in liquor recovery and where 50% of the organic load remaining after spent liquor neutralization is removed from the condensate via stripping. Possibilities for effluent treatment (filtering, flotation, sedimentation) to reduce this load further are also reviewed. (Speckhard-IPC)
W79-02370

INTERIM RECOMMENDATION FOR THE USE OF BUFFER STRIPS FOR THE PROTECTION OF SMALL STREAMS IN THE MARITIMES,
New Brunswick Dept. of Fisheries and Environment, Fredericton. Maritime Forest Research Center.
H. van Groenewoud.
Canadian Forestry Service, Information Report M-X-74, 21 p, 1977. 1 fig, 1 illus, 30 ref.

Descriptors: *Lumbering, *Forest watersheds, *Water pollution control, Clear-cutting, Water pollution sources, Cutting management, Land clearing, Runoff, Watershed management, Pulp and paper industry, Wood wastes, Water pollution, Surface waters, Streams, Heating, Silting, Springs, Bogs, Buffer strips, Logging equipment, Soil conservation.

The detrimental effects of clearcutting stream banks and other logging practices are discussed, and preliminary recommendations are made for the use of buffer strips to minimize these effects. A 65-m (200-ft) wide buffer strip is not always necessary for protection against heating of the stream water. On relatively flat terrain, a buffer strip as narrow as 15 m (50 ft) will provide adequate protection against both heating and sediments. On moderately sloping terrain a 65-m (200-ft) strip is adequate if reasonable care is taken in the laying out of skid trails and haul loads. The buffer strip should extend the full length of the stream and also protect the major springs. Logging equipment should not be allowed to cross the buffer strip except where adequate protection measures have been taken. In boggy areas bordering streams, cutting by chain saw and hauling by cable can be allowed up to 15 m from the stream. (Witt-IPC)
W79-02384

RANGE CATTLE IMPACTS ON STREAM WATER QUALITY IN THE COLORADO FRONT RANGE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
S. R. Johnson, H. L. Gary, and S. L. Ponce.
Department of Agriculture, Forest Service Research Note RM-359, 8 p, September, 1978. 2 fig, 1 illus, 14 ref, 2 tab.

Descriptors: *Water quality, *Pastures, *Cattle, *Colorado, *Surface waters, Grazing, Ranges, Bacteria, Water pollution, Water pollution sources, Livestock, Trout Creek(Colorado).

Studies on two adjacent pastures along Trout Creek in central Colorado indicated only minor effects of cattle grazing on water quality, but bacterial contamination of the water increased significantly. When the cattle was removed, bacterial counts dropped to levels similar to those in the ungrazed pasture. (Witt-IPC)
W79-02386

PRECIPITATION AND RUNOFF WATER QUALITY FROM AN URBAN PARKING LOT AND IMPLICATIONS FOR TREE GROWTH,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-02387

WATER-QUALITY MONITORING IN THE AMERICAN URBANIZING SOUTHWEST,
Metcalf and Eddy, Boston, MA.
For primary bibliographic entry see Field 5B.
W79-02397

OPTIMIZATION AND TESTING OF HIGHWAY MATERIALS TO MITIGATE ICE ADHESION,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 8G.
W79-02408

ACID MINE DRAINAGE AND SUBSIDENCE: EFFECTS OF INCREASED COAL UTILIZATION,
Industrial Environmental Research Lab., Cincinnati, OH.
R. D. Hill, and E. R. Bates.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 092, Price codes: A03 in paper copy, A01 in microfiche. Final Report No EPA-600/2-78-068, April 1978. 38 p, 2 fig, 11 tab, 18 ref.

Descriptors: *Acid mine water, *Mine wastes, *Coal mines, *Settlement, *Waste treatment, Mine drainage, Subsidence, Soil management, Soil engineering, Soil stability, Slope stability, Groundwater resources, Aquifers, Legislation, Surface mining control and reclamation act.

In 1969, it was estimated that over 10.000 miles of streams had been degraded by acid mine drainage (AMD), a unique pollutant, because acid generation and discharges continue after mining has ceased. Underground mines contribute over 70% of the AMD, of which a significant amount is contributed by inactive mines. Subsidence, the instability within rock created by the void resulting from mining operations, disturbs natural drainage areas, sewage lines, roads, and bridges, and can intercept groundwater supplies, diverting them to deep mines. Projected increases of AMD and subsidence beyond the 1975 levels for the years 1985 and 2000, based on current mining trends and the National Energy Plan (NEP), are presented. No increases are projected for AMD from surface mines or waste, because enforcement under present laws is expected to control this problem. AMD from underground mines is expected to increase

16% in 1985 and 10% by 2000; subsidence is projected to increase 34% in 1985 and 115% by 2000. The smaller increase in AMD in 2000 over 1985 reflects the impact of Public Law 96-87, the abandoned mine program. The projected subsidence figure for the year 2000 may be smaller if subsidence control measures are adopted. Available AMD control and treatment technology are summarized, and subsidence cause and effect control are discussed. It is recommended that AMD point discharges be treated during active mining, and that Federal, State and local governments cooperate to address subsidence problems. (Davison-IPA)
W79-02409

SURVEY OF ENVIRONMENTAL REGULATIONS APPLYING TO GEOTHERMAL EXPLORATION, DEVELOPMENT, AND USE,
WAPORA, Inc., Washington, DC.
G. V. Beeland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 023, Price codes: A12 in paper copy, A01 in microfiche. Final Report No EPA-600/7-78-014, February 1978. 254 p, 3 fig, 14 tab, 19 ref, 13 append. 68-03-2371.

Descriptors: *Legislation, *Environmental control, *Geothermal development, Air pollution, Water pollution, Solid wastes, Waste disposal, Waste identification, Landfills, Water quality, Toxicity, Subsidence, Sedimentation, Permits.

A survey of the local, State, Federal and federally approved ordinances, statutes, regulations, and standards designed to minimize adverse environmental effects of pollution sources in the production and use of geothermal resources is presented. The areas of greatest concern include: air and water pollution control, noise reduction, land disposal of wastes, subsidence control, radiation control, and erosion and sedimentation control. Analyses of the regulations are made with regard to resource definition, pollutants currently not controlled, duplicity and overlaps in permit and impact assessment requirements, the lack of uniformity between states, and the probable future approaches to the regulatory problems. (Davison-IPA)
W79-02410

HAZARDOUS MATERIAL SPILLS: A DOCUMENTATION AND ANALYSIS OF HISTORICAL DATA,
Factory Mutual Research Corp., Norwood, MA.
J. L. Buckley, and S. A. Weiner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 090, Price codes: A11 in paper copy, A01 in microfiche. Final Report No EPA-600/2-78-066, April 1978. 244 p, 48 fig, 8 tab, 9 ref, 9 append. 68-03-0317.

Descriptors: *Accidents, *Hazards, *Spills, *Documentation, *Data collections, Negligence, Equipment failure, Statistics, Industrial operations, Safety, Water pollution, Analysis.

The goal of this study was to further hazardous material spill prevention by gathering and analyzing spill data to provide guidance for future research. Of the 1500 incidents scanned, 10% were documented as hazardous, and a computer program was prepared to provide the desired sorts. Frequency distributions of the data were obtained as a function of the operational areas, primary cause, and other significant information for each spill incident. A hazard potential scheme was developed to rank spills according to their potential severity, which listed quantity and toxicity of the material, so that comparisons of the spills could be made. The frequency distribution by Hazard Potential Category for primary causes and operational areas, such as in transit, loading-unloading areas, in plant storage and in plant processing, were used to distinguish and evaluate problem areas. (Davison-IPA)
W79-02411

EFFECT OF DISSOLVED OXYGEN AND REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP AND MARSH SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W79-02426

HYPERSALINE LAGOONAL DEPOSITS AND PROCESSES,
University of Southern California, Los Angeles. Dept. of Geological Science.
For primary bibliographic entry see Field 2L.
W79-02430

ANALYSIS OF THE ENVIRONMENTAL CONTROL TECHNOLOGY FOR OIL SHALE DEVELOPMENT,
Utah Univ., Salt Lake City. Coll. of Engineering
N. deNevers, D. Eckhoff, S. Swanson, B. Glenne, and F. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-404301, Price codes: A13 in paper copy, A01 in microfiche. Report No COO-4043-1, February 1978. 300 p, 50 fig, 22 tab, 111 ref, 8 append. EY-76-S-02-4043

Descriptors: *Oil shales, *Water pollution control, *Air pollution control, *Waste disposal, Clean Air Act, Water Quality Act, Waste treatment, Solid wastes, Effluents, Emissions, Vegetation establishment, Erosion control, Strip mines, Strip mine wastes, In-situ retorting, Surface retorting, Land tenure.

The proposed environmental control technology for the various oil shale projects now under development are comprehensively examined. Emphasis is on the application of the technologies to the three Federal prototype lease projects: C-b, Rio Blanco, and White River, as well as two others, where including them seemed appropriate. Control of air pollution, water pollution, and disposal, stabilization and vegetation of the processed shale were investigated. Basic air pollution control will be to minimize the emissions of recognized air contaminants through the utilization of technologies applied by related industries. Prevention of any surface or subsurface flow of contaminated water leaving the shale processing site will be the basis for water pollution control strategy. Two of the three Federal lease projects have converted from strip mining and surface retorting to in-situ retorting. A comparison of in-situ and surface processing from an environmental viewpoint is presented. (Davison-IPA)
W79-02432

PROCEEDINGS OF A WORKSHOP ON THE EVALUATION OF MODELS USED FOR THE ENVIRONMENTAL ASSESSMENT OF RADIONUCLIDE RELEASES.
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-02434

ADVANCES IN STORM AND COMBINED SEWER POLLUTION CONTROL ABATEMENT TECHNOLOGY,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W79-02437

MANPOWER UTILIZATION AND FUTURE NEEDS OF MANUFACTURING INDUSTRIES IN WATER POLLUTION CONTROL,
Utah State Univ., Logan. Coll. of Engineering.
E. J. Middlebrooks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 689, Price codes: A06 in paper copy, A01 in microfiche. June 1974: 105 p, 16 fig, 30 tab, 11 ref, 1 append. 5-SF-WP-1.

Descriptors: *Manpower, *Manpower projections, *Waste water treatment, *Personnel management, *Projected planning, *Water quality standards, Occupations, Labor supply, Forecasting, Long term planning, Industrial wastes, Water pollution treatment.

Future manpower requirements in industrial waste water treatment are discussed. Data derived from the 1968 Census of Water Use in Manufacturing, and Environmental Protection Agency (EPA) poll, and an Environmental Science Services Corporation (ESSC) report were used to develop the total numbers of personnel in various industry categories working on water pollution control, and to develop staffing models for the occupational categories. Projections made with ESSC models appear to be more realistic than those made with EPA models, because too little data on large plants was available. Estimated manpower involved in industrial water pollution control during 1974 was from 540,000 to 900,000, with a projected increase of 300 to 400% for the following five years. It is anticipated that the rate of increase in work force would be directly related to the rate at which new treatment standards will be implemented and enforced. The increased work force will result in the need for intensive educational and training programs to upgrade existing plant personnel, and to facilitate advanced treatment concepts and automation. Although plant automation may reduce the number of personnel directly employed in waste water treatment, skilled operators and technicians will be needed to calibrate and control the facilities. Much of the material presented is tabulated with regard to the type of industry, the quality and quantity of its effluent, the number of people in waste water treatment, and the jobs associated with waste water treatment. (Davison-IPA)
W79-02438

STORM AND COMBINED SEWER POLLUTION CONTROL PROGRAM REPORTS. RESEARCH, DEVELOPMENT, AND DEMONSTRATION GRANT, CONTRACT, AND IN-HOUSE PROJECT REPORTS.
National Environmental Research Center, Edison, NJ. Edison Water Quality Research Div
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 155, Price codes: A02 in paper copy, A01 in microfiche. January 1972. 10 p.

Descriptors: *Bibliographies, *Research and development, *Water pollution control, *Storm drains, *Sewers, Standards, Regulation, Management, Grants.

A listing of EPA-sponsored research and developing grant, contract, and inhouse project reports provided in report number order. The title, author, and source of the reports are included. These reports, collectively, are called the Water Pollution Control Research series and describe the results and progress in the control and abatement of pollution in our nation's waters. (Gibson-IPA)
W79-02442

THE CRUSTACEAN ZOOPLANKTON OF GRASMERE BEFORE AND AFTER A CHANGE IN SEWAGE EFFLUENT TREATMENT,
Freshwater Biological Association, Ambleside. (England).
For primary bibliographic entry see Field 5C.
W79-02458

FISH FARMS ARE HAVING TO WATCH THEIR WASTE.
Vandkvalitetsinstitutet, Hoersholm (Denmark)
Fish Farming International, Vol. 5, No. 3, p 19, 1978. 1 tab.

Descriptors: *Fish farming, *Nutrients, *Waste water treatment, *Settling basins, *Aquiculture, Farm ponds, Fish harvest, Fish management, Water pollution sources, Animal wastes(Wildlife), Suspended solids, Fish hatchery, Commercial fish

The rapid development of fish farming has focused attention on the ecological problems generated by the discharge wastes from these farms. Pollutants consist mainly of unconsumed fish feed and fish feed wastes. This article reports on a Danish attempt at using settling tanks to reduce the discharged suspended solids. The authors report that by utilizing the tanks a decrease of up to 80% in suspended solids was obtained. (EIS-Deal)
W79-02474

THE EFFECTS OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
H. D. Drechsler, and P. N. Nemetz.
Water Resources Bulletin, Vol. 14, No. 5, p 1094-1104, October 1978. 7 fig, 1 tab, 11 ref.

Descriptors: *Water quality standards, *Water quality control, *Water pollution control, *Water policy, Regulation, Monitoring, Sampling, Pollutant identification, Data collections, Statistical methods, Reliability, Analytical techniques, Toxicity, Bioassay, Methodology.

The hypothesis of this paper is that the frequently used regulatory practice which employs point estimates in water pollution control objectives, in combination with monitoring at infrequent intervals, is an inadequate scientific procedure for the measurement and control of pollution. The first part of this paper outlines the relevant sampling theory which applies to the measurement of effluent from industrial plants and describes the possible errors in sampling practice which currently affect the interpretation and enforcement of environmental standards. In the second part of the paper, the authors describe briefly the environmental significance of biological damage functions. In the final part of the paper, the authors recommend that existing pollution control regulations be restructured to be more efficient and effective in the protection of both corporate and social interests. By adopting two different approaches to regulation depending upon the nature of the appropriate damage functions and critical fish species, it is possible to reduce significantly the waste of resources.
W79-02498

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A SIMULATION MODEL FOR RESOURCE POLICY EVALUATION,
W. E. Tyner, and R. J. Kalter.
Cornell University, Ithaca, NY, Department of Agricultural Economics, Paper 76-35, 1976. 47 p, 7 fig, 3 tab, append. NSF SIA74-21846.

Descriptors: GEN2 model, *Simulation analysis, *Computer models, *Natural resources, *Policy, *Evaluation, *Methodology, *Model studies, Monte Carlo method, Economics, Resources development, Federal government, Leases, Private sector, Public sector, Computer programs, Governments, Costs, Subsidies, Investment.

The Generalized resource Policy Evaluation Model, GEN2, incorporates discounted cash flow techniques to simulate private sector response to public resources policies. Such response tends to be similar regrdless of resource. The model is useful for evaluating government policy questions relating to disposition of publicly owned natural resources. An appendix contains operating instructions both for the model and for the program input sequence. The model, written in FORTRAN, can analyze a wide range of leasing policy systems, including bonus bidding, royalty, and Indian production sharing, as well as other policy options such as tax policies, price subsidies, purchase guarantees, price supports, investment subsidies, and other options designed to increase certainty for private investors. Ouputs include statistics on production time horizon, installed capacity, and present value of royalty payments, depletion, taxes and taxable income, profit share or production share payments, production reserves, investment and operating costs, gross revenue, and after tax net present value. Additional outputs are provided for such specialized leasing or other policy options as the royalty bidding system. Monte Carlo simulation with uncertain variables makes it possible not only to determine the change in expected value of outputs when a policy variable is changed, but also the change in variance of outputs. (Lynch-Wisconsin)
W79-02025

GROWTH AND OPTIMAL GROWTH WITH RENEWABLE AND NON RENEWABLE NATURAL RESOURCES,
London Univ. (England).
P. C. Thanh.
Queen's University of Kingston, Ontario, Canada, Institute for Economic Research; Discussion Paper No. 264, (1977), 52 p, 6 fig, 27 ref.

Descriptors: *Optimization, *Economic growth, *Mathematical models, *Natural resources, Model studies, Economics, Competition, Reviews, Conservation, Profit, Resource allocation, Marginal utility, Consumption.

Natural resources are examined in the context of economic growth, and a review of literature is given. The free competitive market cannot be relied upon to bring about best natural resources use. Efficient growth is only compatible with greatest protection of renewable resources. For growth under competition a 'golden rule for resource utilization' is described: In a competitive economy dependent on natural resources, steady growth is possible only if the ratio of resource utilization to the resource stock is constant; the saving ratio is proportional to the profit share (ratio of output growth rate and sum of output growth rate and resource utlilization rate). The most efficient growth path for exhaustible resources is one in which the saving ratio is nearest to the profilt share, and the renewable resources one in which the natural growth rate of resources is at its maximum. The section of the study on normative aspects yields two theorems: (1) for each value of marginal utility elasticity there is a rate of pure time preference whereby the consumption program of an optimizing economy will be the same for both exhaustible and renewable resources; and (2) the asymptotic growth rate of per capita consumption will be negative in an exhaustible resource economy and positive in one with renewable resources if there is a strictly positive pure-time preference rate, without technical progress or population growth, but with an optimal consumption program. (Lynch-Wisconsin)
W79-02032

COORDINATING PUBLIC UTILITY EXPANSION, INDUSTRIAL SITING AND POLLUTION CONTROL: A WORKING DYNAMIC PROGRAMMING ALGORITHM,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02039

THE LIMITED APPLICABILITY OF MARSHALLIAN ECONOMICS TO THE PROBLEM OF POLLUTION ABATEMENT: A SUGGESTED ALTERNATIVE,
Indiana Univ. at South Bend. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02041

MEASUREMENT OF ECONOMIC UNCERTAINTY IN PUBLIC WATER RESOURCE DEVELOPMENT: AN EXTENSION,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-02050

OPTIMAL AND COMPETITIVE USE OF REPLENISHABLE NATURAL RESOURCES BY OPEN ECONOMIES.
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 6C.
W79-02058

MEASURING NATURAL RESOURCES SCARCITY: THEORY AND PRACTICE,
Resources for the Future, Inc., Washington, DC. Quality of the Environment Program.
For primary bibliographic entry see Field 6B.
W79-02059

COSTLY INNOVATION AND NATURAL RESOURCES,
For primary bibliographic entry see Field 6B.
W79-02062

MODEL AIDS PLANNERS IN PREDICTING RISING GROUND-WATER LEVELS IN SAN BERNADINO, CALIFORNIA,
Geological Survey, Laguna Niguel, CA.
For primary bibliographic entry see Field 4B.
W79-02173

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 6B.
W79-02288

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-02289

DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-02450

STOCHASTIC MODELING FOR PREDICTING FREQUENCY DISTRIBUTION OF STAGES IN THERMAL LAKES AT FUTURE PLANNING HORIZONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W79-02495

6B. Evaluation Process

A SIMULATION MODEL FOR RESOURCE POLICY EVALUATION,
For primary bibliographic entry see Field 6A.
W79-02025

QUANTIFICATION, DECISION-MAKING AND ENVIRONMENTAL IMPACT ASSESSMENT IN THE UNITED KINGDOM.
Aberdeen Univ. (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W79-02028

COEFFICIENTS OF POLLUTION: INTERINDUSTRY LINKAGE AND POLLUTION IN BELGIUM,
State Univ. of New York at Binghamton. School of Management.
For primary bibliographic entry see Field 5G.
W79-02031

GROWTH AND OPTIMAL GROWTH WITH RENEWABLE AND NON RENEWABLE NATURAL RESOURCES,
London Univ. (England).

For primary bibliographic entry see Field 6A.
W79-02032

AN ANALYSIS OF NETWORK COSTS: A STUDY OF SYDNEY'S WATER SUPPLY FROM 1890 TO 2001, PART I: RESEARCH METHODS,
Australian National Univ., Canberra. Research School of Social Sciences.
B. M. Firestone.
Australian National University, Urban Research Unit Seminar Paper, EWP 470/77, 1977. 56 p, 16 tab, 30 ref, 3 append.

Descriptors: *Sydney(Australia), *Water supply, *Networks, *Costs, *Economics, *Methodology, *Water consumption(Except consumptive use), Forecasting, *Australia, Municipal water, Reservoirs, Urbanization, Water demand, History, Water rates, Analytical techniques, Population, Financing, Replacement costs, Planning, Decision making, Investment, Economics of scale.

Part I of a study of network costs of the Sydney, Australia water supply system describes the methodology used; part II will explain network costs and relate them to cost projection sensitivity. Aggregate capital and operating costs are given for 1890-1976, and are projected for 1976-2001. This paper postulates hypotheses, describes data and analytical problems in testing data, and presents cost projections. The project is a component of a broader study of the water supply and sewerage experience of several urban areas, aimed at evaluating: (1) returns to scale of this type of urban infrastructure; (2) effects of urban growth patterns on network costs; (3) impacts of residential density on network costs; (4) the 'gressivity' of charging systems; (5) rising finance and replacement costs; (6) the impact of standards and design practice on investment levels; (7) relationships of costs to prices; and (8) the relationship between demand price and supply price for investment decisions. Sydney's population grew from about 354,000 in 1890 to 3.1 million in 1976. Per capita demand has risen from 125 liters/day in the early 1890s to over 470 liters/day in the 1970s. Accounting unit costs are expected to increase from $.103/1000 liters in 1971 to $.205 in 2001, a 99% increase. Unit replacement costs will increase from $.381/1000 liters in 1971 to an estimated $.673 in 2001 (77%). (Lynch-Wisconsin)
W79-02033

NATURAL RESOURCES AND REGIONAL DISPARITIES: A SKEPTICAL VIEW,
L. W. Copithorne.
Economic Council of Canada, Ottawa Discussion Paper 106, 1978. 51 p, 3 fig, 12 tab.

Descriptors: *Natural resources, *Economic development, *Regional development, *Canada, *British Columbia(Canada), *Staple theory, *Forests, *Pulp and paper industry, Oil, Energy, Population, Economic growth, Regional analysis, Economics, Income distribution, Resources development, Tariff, Model studies, Linear programming, Computer models.

A study of the role of natural resources in Canada's regional economic disparities contradicts the 'staple theory' of traditional Canadian economics and supports conclusions of the Economic Council of Canada's 1977 study. The latter attributed economic disparities to differences in productivity and technical, aggregate demand, and urban structure, rather than to natural resources, exports of staples, transportation, and tariffs. The present study uses aggregate measures and multi-regional linear programming models of forest products, gold and base metals, asbestos, and energy. Results strongly suggest that under the current forest resource pricing method in British Columbia, natural resource rents have inflated wage payments in manufacturing, resulting in: (1) the manufacturing sector priced almost out of existence, (2) high local cost of living, (3) inemployment, and (4) stimulation of inmigration despite unemployment. Other conclusions: (1) interregional migration is ineffectual in changing long-run wage rates: (2) in a competitive trading region (unlike British Columbia), the general wage level is determined in nonprimary trading sectors, independently of the natural resource endowment; (3) some surpluses in resource industries are monopoly profits, not Ricardian economic rents; and (4) government equalization transfer of economic rents have been smaller than transfers under the oil export tax/import scheme or Churchill Falls power agreement. (Lynch-Wisconsin)
W79-02034

THE CHOICE OF EFFICIENT POLLUTION POLICIES: TECHNOLOGY AND ECONOMICS IN THE CONTROL OF SULPHUR DIOXIDE,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 5G.
W79-02038

ON THE OPTIMAL POLICY FOR EXPLOITING RENEWABLE RESOURCE STOCKS,
Victoria Univ. of Manchester (England).
J. McInerney.
Journal of Agricultural Economics, Vol 29, No 2, p 183-188, May 1978. 2 fig, 2 ref.

Descriptors: *Mathematical models, *Natural resources, Economics, *Renewable resources, *Optimization, *Policy, Model studies, Resource allocations, Cost-benefit analysis, Marginal costs, Marginal benefits, Discount rates, Demand, Planning, Public benefits.

The author revises his analysis of 'destructible, renewable stock resources' in a previous paper on natural resource economics (1976), which contained certain errors. Two aspects require revision: (1) discussion of optimal allocation of the resource stock (marginal net benefits equal in each period) and the accompanying figure (erroneously showing the equality of marginal gross benefits) were both incorrect and (2) explanation of the derivation of user costs of current consumption was incomplete and the marginal user cost curve was thereby inaccurately specified. The full model for renewable resource stocks is presented again. The analysis assumes: (1) a planning horizon for the present and the future; (2) an initial resource stock growing by a constant proportion, with all available resource units consumed by the end of 'the future'; (3) knowledge of current and future resource demand curves measuring marginal social benefits (MSB) gained from consumption; (4) constant marginal resource extraction costs (MEC) for each period; and (5) future MSB and MEC expressed in present values, with discount rates reflecting society's time preference. The optimal resource utilization (or conservation) policy is that interperiod allocation pattern which maximizes aggregate net benefit to society from its resource stock, implying a balance between marginal net benefit of consumption in each period. (Lynch-Wisconsin)
W79-02040

THE LIMITED APPLICABILITY OF MARSHALLIAN ECONOMICS TO THE PROBLEM OF POLLUTION ABATEMENT: A SUGGESTED ALTERNATIVE,
Indiana Univ. at South Bend. Dept. of Economics
For primary bibliographic entry see Field 5G.
W79-02041

ISSUES IN WATER DEVELOPMENT DECISIONS: A DISCUSSION PAPER,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
G. Levine.
Economic Bulletin for Asia and the Pacific, Vol 27, No 2, p 109-117, December 1976.

Descriptors: *Planning, *Water resources development, *Decision-making, *Planning, *Theoretical analysis, *Irrigation, Flood control, Reservoir design, Drainage, Financing, Multiple-purpose projects, Crop production, Agriculture, Land values, Benefits.

Major issues in water resource development are identified and analyzed. Though emphasizing irrigation, the discussion applies also to flood protection, drainage, and power development. Issues are posed as either/or situations for clarity. A general issue is how uncertainty at the project decision stage and project design stage can be dealt with, including: (1) water-based development vs other bases, (2) utilization of natural rainfall vs irrigation, (3) single vs multi-objectives, (4) autonomous vs directed development, (5) private vs public projects, (6) new projects vs rehabilitation of older ones, (7) large vs small projects, (8) staging and phasing, and (9) who pays--the farmer or 'others' Uncertainties in decision and design parameters relate to data defining the basic water resources, estimated reservoir storage life, drainage, plant disease, and public health, compounded at the design stage by almost complete exclusion of the human factor in deriving design parameters. Some evidence suggests that more arid areas emphasize directed projects, while in more humid regions autonomy is more common. New projects usually will result in land value increases and changes in crop production, while rehabilitation will have a lesser impact on such aspects. Large projects more efficiently use limited human resources and physical elements, are more easily financed, and generate major benefits even during the construction period. (Lynch-Wisconsin)
W79-02042

THE BUSINESS OF POLLUTION CONTROL - A BED OF ROSES OR THORNS.
For primary bibliographic entry see Field 5G
W79-02044

ECONOMETRIC ANALYSIS OF ENVIRONMENTAL POLICY: ESTIMATION OF A MODEL OF THE CANADIAN PULP AND PAPER INDUSTRY,
McMaster Univ., Hamilton (Ontario)
R. A. Muller
Canadian Journal of Economics, Vol 11, No 2, p 263-286, May 1978. 2 tab, 11 ref, 1 append.

Descriptors: *Pulp and paper industry, *Canada, *Mathematical models, *Econometrics, *Pollution abatement, *Economic impact, *Costs, Economics, Model studies, Estimation, Policy, Industrial production, Prices, Newspring, Export, International trade, Input-output analysis, Regulation, Simulation analysis.

An econometric model of the Canadian pulp and paper industry, designed to simulate effects of changes in production costs due to mandatory pollution controls, is specified and estimated. Expected costs of pollution control should not depress output more than 2% if cost increases average about 6%. In simulation runs the model tracked long-term fluctuations in major variables with tolerable accuracy. It consistently demonstrated low sensitivity to random variables, with less than unitary elasticities of major variables with respect to real income changes, unit factor requirement changes, and exchange rate variation. This insensitivity persisted despite a series of modifications of numerical parameters. The main qualitative conclusions remained unchanged when various coefficients were altered by an amount equal to their standard error. The basic model was specified to reflect the oligopolistic nature of the industry. Three product groups were specified--newsprint, woodpulp export, and other paper and board--and a unique output determination model was applied to each. Increase in costs due to any particular environmental policy will vary with the level of treatment adopted, the pulping process used, and characteristics of individual mills. The model is general enough to be potentially useful for such issues as the impact of tax incentives or changes in foreign aggregate demand. (Lynch-Wisconsin)
W79-02046

THE ECONOMIC CONSEQUENCES OF THE 200-MILE SEABED ZONE: THE REPLENISHABLE RESOURCES CASE,

St. Mary's Univ., Halifax (Nova Scotia).
For primary bibliographic entry see Field 6E.
W79-02048

IMPLICATIONS OF ALTERNATIVE MEASURES OF NATURAL RESOURCE SCARCITY,
Washington Univ., Seattle.
G. M. Brown, Jr., and B. C. Field.
Journal of Political Economy, Vol. 86, No. 2, p229-243, April 1978. 2 fig, 1 tab, 31 ref. NSF SIA 75-15189.

Descriptors: *Measurement, *Indicators, *Scarcity, *Natural resources, *Methodology, Economics, Unit costs, Prices, Rents, Mathematical models, Model studies, Costs, Renewable resources, Nonrenewable resources, Marginal discovery costs, Marginal replenishment costs, Technology, Resource extraction, Theoretical analysis,

Three commonly used indicators of natural resource scarcity--unit cost, product output prices, and rental rates--are evaluated as deficient. Rental rates or a proxy--marginal discovery costs--are preferred over the other measures, but none is ideal. In some cases good scarcity indicators may be nonexistent. Barnett and Morse's unit Cost measure, the most commonly cited scarcity index, is ambiguous and mistakes certain types of technological progress for growing natural resource sarcity, mistakes ease of adjustment to increasing scarcity for increasing scarcity itself, is a lagging rather than a leading indicator, and does not reflect expected future discovery or extraction costs. The real price of natural resource-intensive products is somewhat superior to unit cost as it reflects expected discovery and extraction costs, but technical progress distorts its scarcity signal. Real price can rise or fall depending on which price deflator is used to adjust the nominal resource price. Neither real price nor unit cost is a reliable scarcity indicator in common property situationss. Rental rates indicate increasing scarcity in an economic sense, but lack of data renders their use imparctical, and marginal discovery costs (or mariginal replenishment costs in the case of renewable resources) are more useful as indicators. (Lynch-Wisconsin)
W79-02049

MEASUREMENT OF ECONOMIC UNCERTAINTY IN PUBLIC WATER RESOURCE DEVELOPMENT: AN EXTENSION,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.
American Journal of Agricultural Economics, Vol. 60, No. 2, p 241-244, May 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Risks, *Weibull probability distribution, *Cost-benefit analysis, *Methodology, *Water resources development, *Spewrell Dam Project(GA), *Water management(Applied), Analytical techniques, Georgia, Dams, Measurement, Economics, Decision making, Probability, Distribution, Monte Carlo method, Triangular distribution.

Taylor and North's incorporation of economic uncertainty into benefit-cost analysis is extended through utilization of the Weibull probability distribution, which permits great flexibility in input values. The technique's major advantage is that absolute highest and lowest values in the range of input data need not be specified. The Weibull technique can use best estimates of these values, and allows for uncertainty by adjusting the probability of exceeding those values. Further application of these probability assignment procedures is easy and inexpensive. This paper demonstrates that inclusion of uncertainty in benefit-cost analysis need not be limited to triangular distribution. The technique is demonstrated in use with the Spewrell Bluff Dam Project, Georgia; results are compared with those of Taylor and North. Their subjective estimates (most likely, optimistic, and pessimistic) for Spewrell Bluff, obtained from interviews, are the basis for output comparisons of the Weibull distribution and triangular distribution. Input information for the Weibull distribution is combined by the required algorithm for the output measure specified, i.e., net benefits or benefit-cost ratio, and Monte Carlo techniques are used to simulate final output distribution. The outcome is the mean, standard deviation, and minimum and maximum values of the output distribution. (Lynch-Wisconsin)
W79-02050

STABLE TAXATION SCHEMES IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Centro Teoria dei Sistemi, Milan (Italy).
For primary bibliographic entry see Field 5G.
W79-02051

STUDYING THE ECONOMICS OF A WATERWAY: A CRITIQUE OF STUDIES OF THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
D. Allee, and W. Sander.
Paper No 77-10, April 1977. 28 p, 3 fig, 46 ref.

Descriptors: *McClellan-Kerr Arkansas River Navigation System, *Arkansas River, *Regional development, *Inland waterways, *Multiple-purpose projects, *Cost-benefit analysis, Navigation, Barges, Economic impact, Economic efficiency, Oklahoma, Arkansas, Tulsa(OK), Rivers, Economics.

Previous studies of the impact of the McClellan-Kerr Arkansas River Navigation System are reviewed, and priorities for future research are identified. Studies to date have dealt with economic efficiency or direct benefits, and intersector and interregional impact, with little attention to social equity in terms of benefit distribution and cost allocation. The project provides Tulsa, Oklahoma and four other cities with major public port facilities to service barge navigation; also included are flood control, water-based recreation, hydropower, and reliable water supply were additional benefits. Barge transport began in 1970, and by 1974 shipping amounted to 34.2 million tons valued at $500 million. Between 1970-75, 497 new industrial plants or additions were built, and the interstate highway system along the channel was expanded. Recreationists spent $192 million in 1975. Rebuilding the Arkansas River cost about $2 billion at current prices, and operation and maintenance costs are about $20 million per year. Return on invested capital is estimated at 4.0-13.5%. Total benefits appear to have exceeded costs. Of the $1.1 billion (1963 prices) for business inputs (half for labor), over 70% was spent in the region, and the project has generated $2 billion in income (50% in the region). Research needs include: (1) locational response to shifts in transportation cost structure, (2) effects of product demand on sector activity and income, and (3) waterway impact on entrepreneurial capacity. (Lynch-Wisconsin)
W79-02052

WATER UTILIZATION AND REALLOCATION IN CHILE: A STUDY OF THE PIRQUE VALLEY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
L. L. Parks, and D. E. Hansen.
American Journal of Agricultural Economics, Vol 60, No 2, p 207-213, May 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Water allocation(Policy), *Water rights, *Water utilization, *Pirque Valley(Chile), *Irrigation, *Chile, Agrarian reform, Water supply, Cost-benefit analysis, Beneficial use, Governments, Policy, Economic efficiency, Agriculture, Linear programming models, Model studies, Economics, Optimization, Income distribution, Equity, Valleys.

Although the 1967 Chilean Agrarian Reform Law's Water Code requires equalization of water rights per-hectare in each homogeneous farming area, data from the Pirque Valley south of Santiago shows that costs of changing water allocations would probably exceed benefits; equal per-hectare water allocation would result in economic inefficiency and a worsened income distribution. While optimum economic water allocation would considerably improve income distribution, aggregate income gains would not exceed 5%. Alternative means of improving current inefficient or inequitable water allocations while maintaining the existing delivery system include: (1) 'turnos', in which water is deverted through one canal branch at a time rather than through all branches simultaneously; (2) increased use of farm reservoirs to capture night flow; and (3) water pricing, especially marginal-cost pricing. Each method has drawbacks, such as shortage of water control gates and damage to the unlined canals (method 1), effects on other canal associations (method 2), and lack of water-measuring devices and excessive transactions costs (method 3). The present system has several advantages, however, and appears in general to be relatively efficient and equitable. (Lynch-Wisconsin)
W79-02053

IS IT TIME TO DO A BENEFIT-COST ANALYSIS FOR THE LOCATION OF A POWER PLANT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
D. J. Allee.
Paper No 77-15, May 1977. 8 p, 11 ref.

Descriptors: *Power plants, *Sites, *Locating, *Cost-benefit analysis, *Cayuga Lake(NY), *Somerset(NY), Lake Ontario, Lakes, New York, Electric power plants, Environmental effects, Environmental economics, Planning, Decision making, Willingness to pay, Economics.

Benefit-cost analysis for deciding whether to grant a permit to New York State Electric and Gas Corporation for building a coal-fired power plant on Cayuga Lake or on Lake Ontario at Somerset rests on two criteria: (1) whether the power plant (the intermediate good proposal) makes economic sense without considering the impact on natural site values; and (2) whether advantages of locating the plant at Cayuga Lake outweigh the loss in unique natural values. The Somerset site would cost an additional $15 million in higher wage rates and a more expensive configuration for water intake and discharge, compared with Cayuga Lake. Methodology exists for estimating in dollars many nonmarket values required by such analysis, such as willingness of people to pay for the difference in cost between the two sites. Important factors to consider are traffic accidents and delays at grade crossings, increased taxes and expenditures for construction, and the relative uniqueness of the two sites. It is concluded that if benefits of preserving the natural site and benefits of constructing the plant are nearly equal, the decision should be delayed for reconsideration of possible effects, while if benefits of the natural site are significantly greater, the plant should not be located there. Technology is bound to increase the uniqueness of a natural area over time, and income effects will likewise augment the value of such areas. (Lynch-Wisconsin)
W79-02054

MEASURING NATURAL RESOURCES SCARCITY: THEORY AND PRACTICE,
Resources for the Future, Inc., Washington, DC. Quality of the Environment Program.
V. K. Smith.
Journal of the Environmental Economics and Management, Vol. 5, No. 2, p 150-171, 1978. 4 tab, 53 ref.

Descriptors: *Natural resources, *Scarcity, Theoretical analysis, *Methodology, Analytical techniques, *Scarcity indices, Economics, Policy, Econometrics, Static models, Dynamic models, *Model studies, Prices, Economic growth, Mathematical models.

A critique is presented of Barnett and Morse's scarcity indices developed in their study, Scarcity and Growth (1963), which evaluates implications of natural resource availability for economic well-being. Whereas they argued that there is no evi-

dence of growing scarcity of natural resources based on an empirical analysis, the present paper concludes that empirical evidence alone is not sufficient for such a determination. Barnett an Morse relied on two scarcity indices: (1) real unit cost of the particular extractive output, and (2) a price index for extractive outputs relative to the nonextractive sector. These indices are evaluated within comparative static and dynamic frameworks to develop a means of appraising candidate indices, and a simple econometric analysis is given of trend movements in the relative price series for various subsectors and the whole extractive sector. An expanded set of series data is used to reevaluate Barnett and Morse's conclusions. A fundamental problem implicitly ignored in this 'outcome' approach to natural resource scarcity is that it is assumed that all services of natural resources are traded on organized markets; movements in the relative values of nonmarket resources, such as common property environment resources, will not be accounted for in the scarcity indices. (Lynch-Wisconsin)
W79-02059

'THE RELATIONSHIP BETWEEN FIRM AND FISHERY IN COMMON PROPERTY FISHERIES': COMMENT,
Connecticut Coll., New London. Dept. of Economics.
G. R. Visgilio.
Land Economics, Vol. 54, No. 1, p 100-103, February 1978. 1 fig, 1 ref.

Descriptors: *Fisheries, *Economics, *Firms, *Commercial fishing, *Limited entry, *Economic impact, Common property, Model studies, Mathematical models, Equilibrium, Boats, Boat size, Management, Regulation, Output, Marginal costs, Optimization.

Anderson's discussion (1976) of the relationship between firm and industry in a common property fishery is modified to allow for changes in vessel size after introduction of a management scheme restricting the number of vessels, but with no additional controls. Results show that a firm will build bigger boats when the price of effort exceeds its marginal costs in the long run. According to Anderson's model, the level of fishing effort equals the output of an individual fishing vessel, a departure from traditional fishery economic analysis in which vessel output has been depicted in terms of the vessel's catch rate. A graphic representation is used with comparative statics analysis to portray vessel and fishery at the open-access equilibrium and the effort level corresponding to maximum economic yield (MEY) of the fishery. Anderson explains a potential problem inherent in management efforts to achieve MEY by limiting vessel number without also controlling output of effort, but the short-run changes in vessel output identified may understate the magnitude of the management problem when the time period is extended to permit changes in vessel size. It is shown that in the long run each firm or vessel equates price to long-run marginal cost, and therefore constructs the appropriate vessel size or scale of plant. (See also W79-02061) (Lynch-Wisconsin)
W79-02060

'THE RELATIONSHIP BETWEEN FIRM AND FISHERY IN COMMON PROPERTY FISHERIES': REPLY,
Delaware Univ., Newark. Dept. of Economics.
L. G. Anderson.
Land Economics, Vol. 54, No. 1, p 104-105, February 1978. 2 ref., NSF/RANN 75-11205.

Descriptors: *Fisheries, *Economics, *Firms, *Commercial fishing, *Limited entry, *Economic impact, Common property, Model studies, Mathematical models, Equilibrium, Boats, Boat size, Management, Regulation, Marginal costs, Output, Rent, Cost-benefit analysis, Costs, Optimization.

A reply is offered to Visgilio's comments (1978) on the author's paper on a common property fishery in which a management scheme is introduced limiting the number of fishing vessels in order to achieve maximum economic yield. Visgilio predicts that firms will build bigger ships when their number becomes limited, in response to the price of effort exceeding its marginal costs in the long-run. While the present author agrees with comments regarding the long-run cost curves of individual vessels, especially those concerning the long-run marginal costs curves of the fishery as a whole before and after vessel number restriction, he disagrees that the extra effort produced by the larger boats will necessarily result in net losses. It is demonstrated that if the new cost level is lower, and if the new return per unit of effort is higher than the original cost level, it is possible for the new rent to be higher. An economic interpretation of these results is that with initial reduction of optimal-sized vessels, the individual owners will increase profits by expanding production, in the long-run being motivated to obtain a larger boat to produce this higher level of effort at a lower cost. Although there will be too much effort produced from a social point of view, potential net gains in welfare still are possible by producing the added effort at lower cost. (See also W79-02060) (Lynch-Wisconsin)
W79-02061

COSTLY INNOVATION AND NATURAL RESOURCES,
A. J. Robson.
Western Ontario University, London, Ont., Canada, Department of Economics, Research Report 7707, 1977. 3 fig, 12 ref.

Descriptors: *Mathematical models, *Natural resources, *Technology, *Resource depletion, *Nonrenewable resources, Model studies, Renewable resources, Optimization, Economics, Investment, Innovation, Oil, Land, Hydroelectric power, Marginal utility.

An optimal model demonstrates basic symmetry between costly innovation and resource depletion; both phenomena affect the asymptotic growth rate, whereas capital accumulation does not. But there is no simple trade-off between innovation and resource depletion--less-productive innovation can mean faster exploitation of the depletable resouce; a larger output share for the depletable resource can imply less innovation and faster exploitation. Similarly, it is possible that more-efficient innovation can lead to a slower rate of exploitation of the resource. The Rawlsian criterion is treated as a limiting case, under which the rent from the depletable resurce could finance innovation, and no investment should occur. These paradoxes seem to moderate the Rawlsian position. The present paper models costly but continuous innovation, and considers two types of limited natural resources: (1) oil, which has a fixed initial stock and is depletable, and (2) hydroelectric power (or land), wich is in fixed flow supply, and although nondepletable, is equally nonaugmentable. The model assumes a constant fraction of output is used to finance innovation, and the rate of exploitation of the depletable resource is constant. These two factors are shown to be more fundamental than the savings rate since they affect the endogenous (asymptotic) growth rate. (Lynch-Wisconsin)
W79-02062

SOME EXTENSIONS OF THE ECONOMIC THEORY OF EXHAUSTIBLE RESOURCES,
Montana State Univ., Bozeman.
R. Cummings.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY. p 1-10, 1977. 15 ref.

Descriptors: *Nonrenewable resources, *Economics, *Theoretical analysis, *Mathematical models, *Resource extraction, Common property, Model studies, Natural resources, Optimization, Timing, Marginal costs, Mining, Economic efficiency.

An analytical model of exhaustible resource extraction describes the optimal time-path of production for a decision-making unit exploiting an exhaustible natural resource under two sets of assumptions: (1) management of production is centralized from a common property source, and (2) the decision-making unit is the firm, assumed to be sole owner of a resource stock as in the theory of the mine. In the first case, profits in the resource area are maximized by equating marginal production costs plus an area-wide user cost among all producing firms (similar to Gordon's requirement for social efficiency in the production from mines). Regarding the appropriated exhaustible resource (where costs increase due to cumulative production) the rate of extraction is reduced, the production period is extended, and the percentage rate of growth in marginal profits is reduced. These results extend earlier studies primarily in three ways: (1) with reference to the theory of the mine, the analytical description of the firm's optimal time-path of exploitation under conditions where costs are affected by cumulative production, is expanded and clarified; (2) the optimal time-path of production from a common property resource under central management is contrasted to Smith's industry model; and (3) possible Pareto optimal ramifications of the centrally managed common property resource are suggested. (Lynch-Wisconsin)
W79-02064

OPTIMAL UTILIZATION AND THE CONTROL OF FISHERIES,
A. Scott
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY., p 155-173, 1977. 4 fig.

Descriptors: *Fisheries, *Optimization, *Resource allocation, *Commercial fishing, *Fish management, Economics, Common property, Farms, Regulation, Marginal productivity, Use rates, Subsidies, Taxes, Equilibrium, Economic rent, Return(Monetary)

A study of optimal resource allocation in the fishery considers: (1) allocation among industries, (2) four forces affecting landings, and (3) methods of regulation. The first section discusses Gordon's analysis of allocation problems posed by the fishery as a type of common property resource, contrasting fishing and farming. Fishermen have lower incomes than farmers; whereas the farmer's return mixes rent, interest, profit, and wage; the fisherman's return omits rent, and includes a wage which is lower due to low opportunity cost. The fisherman's return also includes some profit and interest, which also are low because the share system gives capital a low return and capital immobility may give it a low opportunity cost. Resource allocation to the fishery may be too generous because of the share system, low mobility, and common property. Forces affecting the return from a particular fishery include: (1) diminishing returns wherein application of more labor time on a given vessel may mean a rise in cost per unit of fishing effort; (2) external diseconomies due to excessive number of vessels; (3) population effect, where extra effort reduces the stock of fish, resulting in permanent reduction of the equilibrium catch; and (4) allocation over time (equilibrium of a fish population with the economic system may take centuries). The section on regulation discusses vessel or fisherman limitations, fishing rights fees (as bids), sole ownership, a tax on the catch, and subsidies. (Lynch-Wisconsin)
W79-02065

OPTIMIZATION AND SUBOPTIMIZATION IN FISHERY REGULATION,
London School of Economics and Political Science (England).
R. Turvey
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY., p 175-187, 1977. 4 fig, 8 ref.

Descriptors: *Regulation, *Fisheries, *Optimization, *Commercial fishing, *Economics, Externalities, Model studies, Equilibrium, Costs, Marginal return, Policy, Mesh size, Fishing effort, Marginal productivity, Mathematical models, Fish management, Taxes

Static analysis of a single-trawl fishery illustrates effects of optimization or suboptimization of resource allocation in fishery regulation. In the case of higher demand, greater employment of industry resources occurs, but with smaller total product. Two problems cause this: (1) While the catch of an individual fisherman is proportionate to his own fishing effort, the same is not true of all fishermen together since each imposes an external diseconomy on the others, and the marginal private product of his fishing effort exceeds the marginal social product. (2) Use of smaller mesh size and thus catching smaller fish reduces the number of large fish to be caught later, and in the long run larger mesh size may lower costs of all fishermen together; again, social and private product diverge. Although it is clear that to achieve optimum resource allocation both variables must be regulated, this is not always the case in practice. Two recommendations: (1) a shift to the eumetric curve, and as an alternative (2) a reduction in fishing effort whenever the fishery is on a falling yield curve. Either will raise the catch and/or reduce costs. A complication of regulation of only one of the variables is that catch will initially be reduced. (See also W79-02067) (Lynch-Wisconsin)
W79-02066

OPTIMIZATION AND SUBOPTIMIZATION IN FISHERY REGULATION: COMMENT,
Minnesota Univ., St. Paul.
J. H. Boyd.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 189-195, 1977. 2 fig, 1 ref.

Descriptors: *Regulation, *Fisheries, *Commercial fishing, *Optimization, *Economics, Externalities, Model studies, Mathematical models, Equilibrium, Costs, Marginal return, Marginal productivity, Mesh size, Fishing effort, Policy, Fish management, Taxes.

A critique of Turvey's 1964 paper (see W79-02066) on optimization and suboptimization in fishery regulation contends that it may not be optimal to require either or both: (1) a toll or charge per pound of fish caught, and (2) imposition of a legal minimum mesh size to protect immature fish, as stated by Turvey. There are in fact three possible optimizing prescriptions, depending on conditions: (1) no regulation, (2) a toll only, and (3) a toll plus a mesh-size regulation. Further, in the special case where Paretooptimality does require both types of regulation, there is no necessity to institute regulation by fiat to control mesh size; a penalty toll on all fish in a catch smaller than the minimum would accomplish the same end. The chief fault in Turvey's paper is a failure to clearly state the relationship of certain critical, implicit assumptions in his argument to his public policy conclusions. Three common assumptions are here assessed: (1) growth of fish and natural mortality are functions of age; (2) fishing mortality rate (catch) is proportional to effort; and (3) recruitment into the fish stock number of fish reaching catchable size) is exogenous. In the single-trawl fishery examined, two external diseconomies are identified by Turvey: (1) effort by one fisherman reduces fish available to others; and (2) fish caught when smaller will not be caught later as a larger and more valuable fish, likewise imposing additional costs on the industry. (Lynch-Wisconsin)
W79-02067

GENERAL EQUILIBRIUM WITH A REPLENISHABLE NATURAL RESOURCE,
Arizona Univ., Tucson.
V. L. Smith.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 197-213, 1977. 7 fig, 5 ref.

Descriptors: *General equilibrium models, *Renewable resources, *Economics, *Natural resources, *Fisheries, *Welfare(Economics), Model studies, Mathematical models, Equilibrium, Groundwater, Hunting, Optimization, Use rates, Common property, Stability, Commercial fishing, Competition, Taxes, Quotas, Regulation, Utility.

Stationary general equilibrium in a two-commodity world is described where one commodity is produced from a common property replenishable resource such as an ocean fishery, hunting ground, or groundwater supply. Principal emphasis is on derivation of the production transformation set and its properties since this is where the effect of common tenure is manifest. Also treated is determination of the number of firms in each industry, allowing an extension of partial equilibrium concepts to general equilibrium. The paper discusses: (1) the competitive economy, (2) Pareto optimality, (3) the relationship of user charges and fishing quotas to Pareto optimality, (4) stability, and (5) allocation of firms between industries. In the competitive economy model welfare is unambiguously measured by the per-capita utility function. The Pareto optimal solution for the economy is obtained by maximizing utility subject to technological and biological constraints to determine fish biomass and the units of appropriated resource. A charge for using the social capital represented by the common property stock of fish can, in principle, be used to internalize the external production costs in the fishery; a quota on the fish catch can serve as an equivalent function. The stability of general competitive equilibrium requires that a change in fish biomass must change biological product less than the total harvest of fish after adjusting fishing labor to the new fish stock. (Lynch-Wisconsin)
W79-02068

MATHEMATICAL MODELS OF A FISHERY,
J. Crutchfield, and A. Zellner.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 215-228, 1977. 2 ref.

Descriptors: *Mathematical models, *Fisheries, *Economics, *Commercial fishing, *Fish management, *Animal populations, *Production functions, Model studies, Population dynamics, Equations, Private ownership, Halibut, Prices, Demand, Supply, Costs.

Mathematical models of exploited and unexploited fisheries are described, and a microeconomic analysis of the management of a privately owned fish resource is presented. For the unexploited fishery, the basic relationship is: $dN/dt = rN(1-N/N_s)$, where dN/dt is the instantaneous rate of change of the fish population, N is the population at time t, and r and N_s are fixed quantities. To account for fishery exploitation, traditional economic considerations are incorporated into the biological model. The higher the price is with a given population the larger the quantity supplied to the market by fishing enterprises; also, the larger the population with a given price, the larger the quantity supplied. The biological constraint indicates that the net rate of change in the population is the natural rate of increase minus the amount taken by man per unit time. Effects of changes in consumer income and technological improvement are incorporated into the model. In maximizing profits, the owner is subject to three constraints: (1) a technological production function relating fishing effort and population to output, (2) a cost function for inputs, and (3) a biological constraint. Besides different specification of the production function, this approach differs from others in that the private owner is not assumed to take a sustained yield, with the result that the profit-maximizing solution depends on the interest rate. (Lynch-Wisconsin)
W79-02069

EXPLOITATION OF COMMON-PROPERTY REPLENISHABLE NATURAL RESOURCES,
University of Western Ontario, London.
C. G. Plourde.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 229-239, 1977. 2 fig, 18 ref.

Descriptors: *Common property, *Renewable resources, *Fisheries, *Commercial fishing, *Economics, *Regulation, *International law, Externalities, Model studies, Mathematical models, General equilibrium models, Equilibrium, Quotas, Taxes, Optimization, Utility, Natural resources, Biomass.

A general equilibrium model of a two-commodity economy expands the theory of common property resources as applied to commercial fishing. The model assumes one of the two goods is produced using a common property natural resource; optimal exploitation of this resource is expressed as a control problem. Specific results are obtained by assuming restrictive properties on the functions describing biological growth, production of resource product, and social utility. Aspects analyzed are: (1) the model, (2) steady-state equilibrium for interior solutions, (3) the relation of steady-state biomass to other steady-state values, and (4) taxes vs. quotas in industry regulation. Fishing regulation has usually taken the form of seasonal quotas (e.g., halibut). If the quotas equal the maximum sustained yield, there is no a-priori reason for such programs to be optimal since how to achieve a desired steady state is not specified. The model presented here clearly specifies a desired steady state and how to achieve it from any initial point. Dynamic tax rates can be devised which have the same effect as quotas, while having the advantage of signalling changes in parameters. The tax has the effect of internalizing the common property externality through appropriation. Auctioning of fishing rights may be preferable to per-unit taxes. International control is needed. (Lynch-Wisconsin)
W79-02070

A POLLUTED GOLDEN AGE,
Chicago Univ., IL.
For primary bibliographic entry see Field 5G.
W79-02071

ECONOMICS OF WILDERNESS RESOURCES,
V. L. Smith.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY., p 489-504, 1977. 5 fig, 7 ref.

Descriptors: *Economics, *Environmental economics, *Wilderness areas, *Natural resources, *Resource allocation, *Mathematical models, General equilibrium models, Model studies, Optimization, Scenery, National Parks, National Forests, Public access, Recreation, Recreational facilities, Value, Preservation, Environmental effects, Theoretical analysis, Control theory.

Control theory and stationary general equilibrium theory are used to study a model of public recreational wilderness resources which incorporates such elements as (1) external crowding diseconomies in consumption, (2) deterioration effects of resources use, (3) capacity of the resource for ecological adjustment to use, and (4) the public good aspect of a resource's wilderness value. Several types of equilibria are illustrated and compared: an optimal control solution with and without administrative cost, a corresponding free-use competitive solution, stationary state competitive solutions for undeveloped access technologies, and an optimal solution with administrative cost. Investment in easier access to scenic resources can result in crowding and resource deterioration to the detriment of all users. In many cases, society's best option may be preserving relatively high access costs of wilderness resources. Whereas economic analysis of recreational lands has been primarily concerned with principles and techniques of allocating and valuing land for preservation or recreation as opposed to industrial development, it has neglected managing, developing, and rationing aspects of the use of resources already allocated to recreation. Visitor use of primitive areas has been increasing much faster than use of National Parks in general; Colorado River excursions, for example, have increased 50-fold, compared with a two-fold increase in visits to the Grand Canyon through which it flows. (Lynch-Wisconsin)
W79-02072

FORESTED WETLANDS OF FLORIDA-THEIR MANAGEMENT AND USE,
Georgia State Univ., Atlanta. Dept. of Biology

C. H. Wharton, H. T. Odum, K. Ewel, M. Duever, and A. Lugo.
Center for Wetlands, Phelps Lab, University of Florida, Gainesville, Report DSP-BCP-19-77, June, 1977. 348 p, 202 fig, 13 tab, Final Report to Florida Division of State Planning, (Tallahassee).

Descriptors: *Wetlands, *Land use, *Planning, *Florida, *Swamps, Economics, Forests, *Management.

For public use, this manual summarizes information on the utility of swamps in maintaining a healthy and economically vital landscape for Florida and similar areas elsewhere. This summary draws on a series of research project on wetlands, regional planning of wetland regions, and especially on detailed studies in regional planning, and indications of their value to economic vitality. The volume is intended for land managers, planners, engineers, and citizens participating in the public process of fitting human settlements into the pattern of nature so as to maximize the total value. (Steiner-Mass)
W79-02112

COMPUTER ASSISTED INSTRUCTION IN NATURAL RESOURCE MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 7C.
W79-02161

GEOGRAPHIC ASPECTS OF THE TERRITORIAL REDISTRIBUTION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Inst. of Geografii.
For primary bibliographic entry see Field 4A.
W79-02209

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and R. K. Linsley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 891, Price codes: A08 in paper copy, A01 in microfiche. Report, October 1978. 163p, 16 fig, 12 tab. 70 ref, append. OWRT C-7090(No. 6222), 14-34-0001-6222.

Descriptors: *Model studies, *Mathematical models, *Urbanization, *Water management(Applied), *Decision-making, *Water resources planning, Flood control, Storm runoff, Water supply, Water quality, Recreation, Environmental effects, *Modeling survey, *Model applications, *Modeling costs, *Obstacles to modeling, Baton Rouge(LA.), DeKalb Co.(GA.), Howard Co.(MD.), Knox Co.(TN.), San Francisco(CA.), Seattle(WA.), Southeastern Wisconsin, Washington, D.C.

The past decade has witnessed the growth of mathematical modeling as a valid method of analysis of water resource problems. Results are described of a survey of 349 planning and public works agencies to evaluate and analyze the use of modeling for the planning and management of urban water problems. The goal was to determine the extent of model usage and the impact of modeling on policy and decision making. Forty-three (43) percent of the agencies indicated involvement in the use of urban water modeling, either directly or through consultants, and 31 percent never considered the use of a water model. Federal or state agencies and consultants were the major sources of urban water models. In 52 percent of 220 model applications described by the agencies, the modeling was considered to have had an impact on the plan or policy ultimately adopted. In essentially all the model applications, the modeling was evaluated as very useful or moderately useful and at least as useful as alternative techniques. Obstacles to modeling and information needs for effective planning are explored as a basis for recommendations to improve the use and effectiveness of modeling in urban water planning and management. The report also documents and examines in detail eight case studies of modeling applications by cities, counties, and regional agencies. The case studies include a variety of model types and water problems to demonstrate the utility of modeling for urban water planning and management.
W79-02288

CONSUMER SURPLUS AND ECONOMIC RENT ESTIMATES OF RECREATION VALUE: AN EMPIRICAL AND THEORETICAL COMPARISON,
Utah State Univ., Logan.
E. R. Meale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 853, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, 1974. 113 p, 8 fig, 10 tab, 23 ref, 4 append. OWRT C-4371 (No. 9064)(1), 14-31-0001-9064

Descriptors: *Consumer surplus, *Economic rent, *Recreation, *Economics, Reservoirs, Lakes, *Boating, *Utah, Social values, Water sports, *Recreation demand, Recreation methodology.

Application was made of the consumer surplus and economic rent methods of resource valuation for boating recreation in Utah. Total consumer surplus and economic rent values were estimated for twenty-four boating sites. These values incorporate the relationship existing between the variable use costs and the units of activity associated with the site. The comparison of economic rent and consumer surplus was undertaken through the use of a common mathematical model and empirical observation. Three stages in the calculation procedure were considered in the analysis of the comparison of the two methodologies. The first stage compared the consumer surplus with the economic rent estimation and it was found that the economic rent will exceed the consumer surplus. The second and third stages compared the projected values for an origin visiting a site and the total value for a site. No unique relationship was found between the two resource valuation methodologies. The most significant factors contributing to the inconsistent relationship between economic rent and consumer surplus are the utilization of the number of trips in the economic rent model compared to the number of trips per capita in the consumer surplus model, the constant economic rent per trip compared to the decline in the consumer surplus for an additional trip per capita, and the respective projection factors of the two valuation methodologies.
W79-02290

AN ECONOMIC APPROACH TO WATER SUPPLY PLANNING IN SOUTHEASTERN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. VA. Dept. of Agricultural Economics.
W. B. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 890, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1978. 22 fig, 15 tab, 2 append. OWRT A-076-VA(1).

Descriptors: *Water supply, *Water shortage, *Cost-benefit analysis, Economic efficiency, Water conservation, Waste water treatment, Treatment facilities, *Virginia, Chesapeake(VA), Norfolk(VA), Portsmouth(VA), Virginia Beach(VA), Lake Gaston, Blackwater River, Chowan River, Roanoke River, Appomattox River.

Projected levels of increased use of water in the southeastern Virginia cities of Portsmouth, Norfolk, Virginia Beach, and Chesapeake point to a need for additional sources of water. This research studied principal proposed approaches to this water-supply situation with the objective of developing an economically efficient response, given costs and benefits over time. Specifically, cost-benefit analyses were performed for projected levels of use and for reductions in those levels of use achieved with the use of quotas, price increases, and water-saving devices. An important element of these analyses was the consideration of the costs incurred as a result of waste water treatment with different levels of water use. The levels of the principal types of water use were estimated for each city. This provided a basis for the projection of water demand curves necessary for estimating the value of water. Optimal schedules for the development of additional water sources were derived through the examination of water demand, relative to the costs of operating and expanding water supply and waste water treatment facilities.
W79-02294

PROFILE AND MEASUREMENT OF SOCIAL WELL-BEING INDICATORS FOR USE IN THE EVALUATION OF WATER AND RELATED LAND MANAGEMENT PLANNING,
Texas Transportation Inst., College Station.
P. K. Guseman, and K. T. Dietrich.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper Y-78-2, June 1978. 166 p, 9 fig, 1 tab, 285 ref.

Descriptors: *Land management, *Planning, *Water management(Applied), Water resources development, *Social aspects, Social values, Attitudes, *Social well-being indicators.

As part of the continuing development of the Water Resources Assessment Methodology (WRAM), this report focuses on the Social Well-Being (SWB) account as defined by the Water Resource Council's Principles and Standards. An outline of SWB categories, subcategories, and variables as interpreted from Principles and Standards is included. In addition, for selected variables, definitions, information about measurement, and suggestions for prediction are provided. It is noted that although the set of variables discussed in this report assists in defining SWB, the list is tentative, not exhaustive, and is intended for use within the framework of WRAM. The particulars of each planning study and the judgment of professionals and publics will dictate omission of some variables and inclusion of others. (WES)
W79-02344

NINE FALLACIES OF NATURAL DISASTER: THE CASE OF THE SAHEL,
National Center for Atmospheric Research, Boulder, CO.
M. H. Glantz.
Climatic Change, Vol. 1, p 29-84, 1977. 58 ref.

Descriptors: *Psychological aspects, *Droughts, *Disasters, *Sahel, *Decision making, Project planning, Project post-evaluation, Attitudes, *Social aspects, *Political aspects.

The intent of this analysis is to document the hazards of discussing drought-related issues or forming recovery policies based on generalized and often incorrect beliefs. The generalizations shown to be fallacious in this analysis include: (1) people learn from their mistakes, (2) things will have to change, (3) nomads want to be nomads, (4) when the rains come, everything will return to normal, (5) education is the answer, (6) solutions can be undertaken on a piecemeal basis, (7) political leaders say what they mean, (8) the myth of interdependence, and (9) technology is the answer. When applied to specific situations, the belief in these fallacies is shown to be a hindrance rather than an aid in the understanding of the difficulties involved. Although here applied to the Sahel, the fallacies illustrated by this author can be hazardous in many drought-stricken areas of the world. (Tickes-Arizona)
W79-02398

EVALUATION MODELS FOR PUBLIC MANAGEMENT OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
J. S. Larson.
In: Transactions of the 40th North American Wildlife and Natural Resources Conference, 1975, p 220-228. Published by Wildlife Management Institute, Wash. D.C. OWRT B-028-MASS(15), 14-31

0001-3596.

Descriptors: *Model studies, *Wetlands, Economics, Wildlife, Aesthetics, Flood control, Evaluation, Northeastern U.S., *Management, Massachusetts.

An overview is presented of a series of models which assign relative and economic values to freshwater wetlands. Wildlife, visual-cultural, groundwater and flood control values are considered.
W79-02401

IDENTIFICATION AND DELINEATION OF FRESHWATER WETLAND VALUES,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
. S. Larson.
n: Proceedings: Second Wetlands Conference. anuary 9, 1974, Stolls, Connecticut. Institute of Water Resources, University of Connecticut, Report No. 24, p 1-10, October 1975. OWRT B-23-MASS(16), 14-31-0001-3596.

Descriptors: *Wetlands, Economics, Wildlife, Aesthetics, Flood control, *Evaluation, Northeast U. ., *Classification, Massachusetts.

The need for and means of delineating values of freshwater wetlands. Examples are given of wetland values as derived from research in Massachusetts.
W79-02402

DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
or primary bibliographic entry see Field 4B.
W79-02450

C. Cost Allocation, Cost Sharing, Pricing/Repayment

HE ECONOMICS OF WATER CONSERVATION,
ast Bay Municipal Utility District, Oakland, CA.
or primary bibliographic entry see Field 3D.
W79-02022

INANCING SYSTEM CHANGES,
lack and Veatch, Dallas, TX.
. J. Graeser.
ournal of American Water Works Association, ol. 70, No. 9, p 492-495, September 1978. 3 tab, 1 f.

escriptors: *Financing, Public utilities, *Water pply, *Dallas(TX), Water management(Applied), Costs, Local governments, Water resources development, *Texas, Municipal water, Economics, ater purification, Reservoirs, Bond issues, Safe rinking Water Act, Activated carbon, Regulaon, Local financing.

he Dallas, Texas, water utility demosntrates that cal financing of water utilities is feasible without vernment subsidy. The Dallas utility has been erated by the local government with local fincing since 1936. Services can be rendered at st and at the lowest possible price if revenues are ailable and are protected from diversion to politl expedients. Under this system, local citizens y a fair user charge to the local or regional lity, which can be publicly or privately owned. allas had financed water resources development rough the year 2000 as well as a system of rification, production, and distribution capable supplying growth through 1985, through issuce of 20-year revenue bonds with a 1.5 coverage quirement. Water rates were increased only 20-% in 1951, 1955, 1959, 1969, and 1976. Four ervoirs have been built, also financed with 20-ar revenue bonds supported entirely by utility come. While local water rates were higher than st cities in the 1950s ad1960s, today they are almost comparable. In 1974 the average water rate for 60 large U.S. cities was $.13/cu m for 29 cu m/mo, compared with $.18 for Dallas (30% higher). The Dallas rate is now $.20, with the average income from sale of water about $.12/cu m. The economic impact of the Safe Drinking Water Act is illustrated with installation of a granular activated carbon treatment system. (Lynch-Wisconsin)
W79-02023

STRUCTURING WATER UTILITY BOND ISSUES TO COPE WITH INFLATION,
U. J. Schreiner.
Journal of American Water Works Association, Vol. 70, No. 9, p 496-497, September 1978.

Descriptors: *Public utilities, *Bond issues, *Inflation(Economic), *Water supply, *Financing, *Methodology, Municipal water, Water management(Applied), Investment, Capital, Arbitrage bonds, Advance refunding, Regulation, Legal aspects, Utilities, Timing, Interest rates, Economics.

Water utilities can structure bond issues to reduce borrowing costs, taking into account inflation, by means of two methods not widely employed by municipal utilities: arbitrage bonds and advance refundng. Bond issue planning must consider existing tax and water rates and bonds and advance refunding. Bond issue planning must consider existing tax and water rates and bond covenants, bond reserve requirements, market conditions, competing sales, and amount of outstanding bonds. If the money market looks favorable to the utility, the decision will favor long-term financing because of low interest rates on bonds; an unfavorable money market would suggest short-term financing or long-term financing with provision for early call and redemption of the long-term bonds in order to obtain lower interest rates. Project timing would consider availabiity of federal and state grants. In any municipal bond issue, federal regulations on tax-exempt bonds must be considered, especially those on arbitrage bonds in Section 103(c) of the Internal Revenue Code of 1954; the 'temporary period and the 'reasonably required reserve fund' must be understood. Advanced refunding enables an issuer to sell refunding bonds, to use the bond proceeds to buy taxable federal securities, and to place such securities in escrow for payment at or prior to maturity of the bonds being refunded. Advanced funding is useful for lowering net interest rates, reducing principal, consolidating debt, freeing cash reserves, relieving oppressive bond covenants, and avoiding imminent default. (Lynch-Wiscosin)
W79-02024

THE LONG-RUN MOVEMENT OF THE PRICES OF EXHAUSTIBLE RESOURCES,
Sussex Univ., Brighton (England).
G. Heal.
Economics Seminar Paper Series 77/1, 1977. 30 p, 5 fig, 6 ref.

Descriptors: *Nonrenewable resources, *Natural resources, *Economics, *Equilibrium, *Prices, *Theoretical analysis, Reviews, Competition, Model studies, Mathematical models, Substitution, Interest rates, Forecasting, Long-run analysis.

A theory of resource price movements derived from a review of the literature is presented, and empirical studies, primarily by Barnett and Morse and by the present author, are examined to see if they confirm the theory. Earlier literature leads clearly to the following theory: In market equilibrium under either perfect or imperfect competition resource prices will rise in the long run at a rate dependent on (and in some simple cases equal to) the rate of return on other assets, and will continue to move in this fashion until they approach limits set by substitutes costs; to the extent that such costs are influenced by research and development, upper limits they pose are not exogenous, but will depend on expectations about price movements and on the ability of cost-reducing innovators to secure the full social return to their acitivities. The empirical studies cited are far from conclusive about any of the important issues, and the theory therefore remains to be seriously tested. Work by the present author indicates clear connection between resource price movements and interest rates, and the process by which expectations are formed appears very important. The work of Barnett and Morse seems to contradict the a-priori expectations regarding long-run price movements, but factors which could reconcile the difference include increases in known stocks, cost reductions in the production of substitutes, and desequilibrium behavior of markets. (Lynch-Wiscosin)
W79-02026

AN ANALYSIS OF NETWORK COSTS: A STUDY OF SYDNEY'S WATER SUPPLY FROM 1890 TO 2001, PART I: RESEARCH METHODS,
Australian National Univ., Canberra. Research School of Social Sciences.
For primary bibliographic entry see Field 6B.
W79-02033

ECONOMIC EVALUATION OF FOUR SLUDGE DEWATERING DEVICES,
For primary bibliographic entry see Field 5D.
W79-02037

ON THE OPTIMAL POLICY FOR EXPLOITING RENEWABLE RESOURCE STOCKS,
Victoria Univ. of Manchester (England).
For primary bibliographic entry see Field 6B.
W79-02040

THE PRICE OF NATURAL RESOURCES,
B. Csikos-Nagy.
Acta Oeconomica, Vol 18, No 3-4, p 213-225, 1977. 9 tab, 11 ref.

Descriptors: *Natural resources, *Prices, Theoretical analysis, *Oil industry, *Political constraints, *Economics, *International trade, Economic growth, Economic development, Monopoly, Diminishing returns, Rent, Industrialization, Scarcity, Energy, Developing countries, Profit, History, Export.

A historical survey of theories of monopoly rent and diminishing returns and of the development of the price structure of natural resources concludes that oil price is determined primarily by price policies of producers and users motivated by power politics, not by purely price-theoretical criteria. Although diminishing land return during the rest of this century is possible, it appears that natural resource prices will be determined less by input than by scarcity, and by efforts to attain the highest ground (monopoly) rent. Oil is the most important current mining product, and energy may in the near future be the main barrier to economic growth. Multinational companies have generally kept the price of oil below its relative use value in the past, which created a favorable production structure for developed countries and contributed to the financing of industrialization. The price policy was supported by a budgetary policy comprising two major elements: (1) the tariff system in which natural resources are duty-free and tariffs increase with degree of processing; and (2) the consumer price system, in which a part of the ground rent of natural resources is charged at the consumption goods stage, and not at the exploitation stage. Analysis of world market price conditions suggests an increasing trade war since the oil price explosion of 1973, and a solution within the framework of the free market mechanism does not seem likely. (Lynch-Wisconsin)
W79-02045

OPTIMAL AND COMPETITIVE USE OF REPLENISHABLE NATURAL RESOURCES BY OPEN ECONOMIES.
Guelph Univ. (Ontario).
J. J. McRae.
Journal of International Economics, Vol. 8, No. 1, p 29-54, 1978. 5 fig, 22 ref, 1 append.

Descriptors: *Economics, *Optimization, *Competition, *Resource allocation, *Renewable resources, *Export, International trade, Welfare(Economics), Consumption, Pontryagin maximum principle, Equilibrium, Decision making, Planning, Production, Natural resources, Model studies, Mathematical models.

Intertemporal and consumption paths of an open economy which exports a replenishable, natural resource-intensive commodity in exchange for a manufactured good are investigated. Along the socially optimal intertemporal consumption path to steady state equilibrium, domestic consumption of resource product will increase if net positive investment in the resource stock is taking place; it will decrease if disinvestment is occurring. With the absence of required markets, the competitive economy will not correctly price the natural resource base. Both the mathematical general equilibrium analysis and the geometric analysis in output space shows that stability of the stationary state depends upon the relationship of marginal technological productivity of the resource base to its marginal biological productivity. In general, optimal steady state equilibrium can occur with any resource mass level; policies which advocate maximum sustained yield are thus not necessarily optimal. A competitive economy myopically groping toward an unknown equilibrium through a series of one-period movements will always, in steady state, produce too little resource product and overproduce the import competing good, or quite possibly underproduce both commodities relative to the optimal steady state point. The market can be forced to behave in an optimal fashion by correctly assigning a user charge on the resource stock, and, if possible, an export tax to obtain the most favorable terms of trade. (Lynch-Wisconsin)
W79-02058

DYNAMIC ANALYSIS OF COMMERCIAL FISHING MODEL,
National Chiao-Tung Univ., Taipei (Taiwan). Dept. of Management.
A. Wang, and K. Cheng
Journal of Environmental Economics and Management, Vol. 5, No. 2, p 113-127, 1978. 23 fig, 1 tab, 12 ref.

Descriptors: *Dynamic models, *Mathematical models, *Mathematical models, *Renewable resources, *Commercial fishing, *Fisheries, *Equations, Commercial fish, Fishing, Model studies, Quadratic models, Capital, Investment, Economics.

A dynamic, quadratic commercial fishing model is investigated, and results imply that fishing capital investment is nonexplosive, fishery resources are nonextinctive, and the solution of the bionomic system is globally stable within an invariant region. This paper continues the discussion of a quadratic commercial fishing model begun by Smith, and by Leung and Wang. Smith proposed the quadratic differential equation predator-prey (fishing industry-fish) model, and connected economic and ecological factors more efficiently. The present model is restricted to non-time lag investment decision and to the simplest biological equation. The bulk of this paper is devoted to detailed derivations. (Lynch-Wisconsin)
W79-02063

MANAGEMENT OF RURAL WATER SUPPLY PEAK FLOW RATES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3D.
W79-02194

6D. Water Demand

URBAN WATER: ACCESS, DELIVERY AND INSTITUTIONAL SCARCITY,
For primary bibliographic entry see Field 6E.
W79-02036

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
For primary bibliographic entry see Field 4B.
W79-02185

CONSUMER SURPLUS AND ECONOMIC RENT ESTIMATES OF RECREATION VALUE: AN EMPIRICAL AND THEORETICAL COMPARISON,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W79-02290

6E. Water Law and Institutions

URBAN WATER: ACCESS, DELIVERY AND INSTITUTIONAL SCARCITY,
A. Rew.
Sussex University, Institute of Development Studies. IDS Discussion Paper No. 113, 1977. 27 p, 22 ref.

Descriptors: *Scarcity, *Water supply, *Domestic water, *Public access, *Manila(Philippines), *Institutional constraints, *Water allocation(Policy), Equity, Planning, Municipal water, Water delivery, Equitable apportionment, *Philippines, Political constraints, Economics, Urbanization, Costs, Potable water, Water management(Applied), Water demand, Water rights, Water law, Water policy, Water shortage.

Chronic failure to provide domestic water to a significant part of the population of Manila, capital city of the Philippines, is primarily due to institutional considerations rather than to resource scarcity. It is contended that water shortage problems in many if not all countries are due to similar factors. In Manila the immediate problem is caused by the organizational character of the administrative agencies responsible for allocating water. Only those urban groups and individuals with political power succeed in obtaining access to water; the urban poor are excluded with political power succeed in obtaining access to water; the urban poor are excluded from safe and inexpensive water delivery, and urban water systems continue to grow at the expense of rural areas. A possible policy solution is socialization of water resources, or a system more firmly based on ranked beneficial uses of ground and surface water, giving top priority to municipal or community demands for domestic and essential industrial uses. A composite case study is used to demonstrate the problems of access to water in Manila. In many cases, leaks in the distribution system and use of booster pumps contribute to acute water shortages. In 1969 nearly two-thirds of the Manila water supply brought no economic return to the system because over 50% was unmetered and 30% of billings were not collected. The problems are further compounded by accounting confusion and nonfunctional meters. (Lynch-Wisconsin)
W79-02036

THE CHOICE OF EFFICIENT POLLUTION POLICIES: TECHNOLOGY AND ECONOMICS IN THE CONTROL OF SULPHUR DIOXIDE,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 5G.
W79-02038

THE PRICE OF NATURAL RESOURCES.
For primary bibliographic entry see Field 6C.
W79-02045

A NOTE ON THE WELFARE-ECONOMIC CONSEQUENCES OF EXTENDED FISHING LIMITS,
Bergen Univ. (Norway). Inst. of Economics.
R. Hannesson.
Journal of Environmental Economics and Management, Vol. 5, No. 2, p 187-197, 1978. 2 fig, 5 ref.

Descriptors: *Welfare(Economics), *Economics, *Fishing limits, *Exclusive economic zone, *Law of the Sea, *Commercial fishing, *International law, *International waters, Mathematical models, Models studies, Fisheries, Fish, Prices, Common property, Discount rates, Continental shelf, Fish management, Property rights, Economic efficiency, Fishing, Oceans.

Use of standard two-country two-commodity model to study effects of extending coastal fishing limits shows that the long-term catch will be greater despite seriously overexploited fish stocks; but falling fish prices mean that some if not all of the gains from more efficient fishing will be transferred to consumers in the rest of the world. A United Nations conference is currently considering proposed changes in the Law of the Sea, including the Exclusive Economic Zone, which would give exclusive rights to coastal states over fish and other marine resources in an expanded adjacent sea area. It should not be assumed that the habitat of each fish stock is entirely contained within the fishing limits of the coastal state or that each government will manage the fishery efficiently. In regard to habitat, extended fishing limits would establish joint property rights to fish stocks, and a well-defined group of countries could choose to jointly manage those stocks. As for fishery management, there will be less total gain in efficiency from exclusive fishing rights (none in the limiting case), with coastal countries simply expanding their fishing effort to replace the effort of excluded countries. The basic conclusion is that gains and losses due to exclusive fishing rights are uncertain and vary with each case. (Lynch-Wisconsin)
W79-02047

THE ECONOMIC CONSEQUENCES OF THE 200-MILE SEABED ZONE: THE REPLENISHABLE RESOURCES CASE.
St. Mary's Univ., Halifax (Nova Scotia).
K. S. Chan
Canadian Journal of Economics, Vol. 11, No. 2, p 314-318, May 1978. 4 ref.

Descriptors: *Economic impact, *Renewable resources, *Fisheries, *Fishing limits, *Exclusive economic zone, *Welfare(Economics), *International law, *International waters, Economics, Law of the Sea, Policy, Optimization, Commercial fishing, Model studies, Mathematical models, Oceans, Two-hundred mile zone.

Effects of a proposed 200-mile seabed zone under consideration by the United Nations Law of the Sea Conference are evaluated for a hypothetical completely independent resource stock (such as fish) in the form of separate 200-mile zones. The analysis modifies the framework developed by Markusen (1976) in a study of two countries sharing a common resource stock. The present analysis suggests that taxing foreign fishermen in domestic waters is better than excluding them, except when the resource good is an import good. An implicit assumption is that the foreign country is entirely passive, and therefore this policy recommendation should be regarded as a set of optimal policies at a certain historic stage. At each fairly long historic stage, every country optimizes its national welfare given the conditions of the previous stage. At the initial stage factory fleets are built as a result of protein shortage and the protected fishing industry of a few industrial nations, which overfish the oceans and move into fishing grounds of less industrial coastal stages, causing external diseconomies to the local fishing industry. In the second stage coastal states respond by claiming 200-mile economic zones and by implementing various optimal policies. In a future third stage industrial nations may retailiate. (Lynch-Wisconsin)
W79-02048

PRICING AND STANDARDS IN THE CONTROL OF POLLUTION.
York Univ. (England)
For primary bibliographic entry see Field 5G.
W79-02057

THE IDAHO AND MONTANA PROCEDURES FOR OBTAINING WATER USE PERMITS--POSSIBLE SOURCES FOR IMPROVEMENT OF WYOMING LAW, COMMENTS,
Wyoming Univ., Laramie. Coll. of Law.
W. D. Hickey.
Land and Water Law Review, Vol. X, No. 2, p 435-454, 1975. OWRT A-003-WYO(1), 14-31-0001-5051.

Descriptors: *Water law, Idaho, Montana, *Wyoming, Water rights, *Water permits, Water allocation, Legislation, Prior appropriation.

In 1974 the Idaho and Montana legislatures adopted mandatory permit systems for the initiation of water rights in those states. A critical analysis of each statutory scheme is presented and each is compared with existing Wyoming water law. The benefits and disadvantages of each system are weighed in a discussion of six provisions present in one or two of the three statutory schemes. These provisions include such matters as notice and hearing requirements; grounds, including public interest, for issuing or refusing a permit; conditional permits; time limits within which the responsible state agency must act on the permit application, and within which the applicant must perfect the water right; and final proof of the appropriation. Some possible additions to and improvements of existing Wyoming water law are suggested. Nevertheless, it is concluded that the Wyoming procedure provides for efficient administration of the state's water.
W79-02082

CHANGING MANNER AND PLACE OF USE OF WATER RIGHTS IN WYOMING, COMMENTS,
Wyoming Univ., Laramie. Coll. of Law.
D. B. Riggs.
Land and Water Law Review, Vol X, No 2, p 455-476, 1975. OWRT A-003-WYO(2). 14-31-0001-5051.

Descriptors: *Water law, *Wyoming, *Water rights, *Legislation, Diversion, Prior appropriation.

The Wyoming Legislature in 1973 and 1974 altered significantly the method by which Wyoming water users may change the use or place of use of their water rights, as well as the substantive rights of such users to effect changes. These legislative developments are examined against the backdrop of the then existing law and analyzed for potential problems which may arise in their application. The Wyoming Legislature in 1909 enacted the original 'no change' statute. This statute severely curtailed the application of the more liberal common rule which allowed changes in the point of diversion, place of use, and of the use itself, so long as rights of others were not impaired. In the interim, however, the basic statutory 'no change' provision became swallowed by exceptons. While the 1973 and 1974 enactments did not expressly repeal the original 'no change' provision, they at least significantly altered procedures for making changes and, arguably, repealed the provision. Procedures dictated by the new provisions are described. Problems may arise when there are: changes from nonconsumptive to consumptive uses; changes involving the nature of required flow; changes affecting seepage and evaporation; and changes resulting in various types of injuries to other users. Notwithstanding the problems which may arise in the application of the new statutes, a cautious stamp of approval is given to the 1973 and 1974 legislative developments.
W79-02083

PROCEDURAL INCONSISTENCIES AND SUBSTANTIVE ISSUES IN THE FEDERAL RESERVED WATER RIGHTS DOCTRINE. CASE NOTE, UNITED STATES V. AKIN, 504 F.2D 115 (10TH CIR. 1974),
Wyoming Univ., Laramie. Coll. of Law.
J. O. Beppler.
Land and Water Law Review, Vol. X, No. 2, p 477-487, 1975. OWRT A-003-WYO(3), 14-31-0001-5051.

Descriptors: *Water law, *Water rights, Colorado, Wyoming, *Reservation doctrine, *Federal-State water rights conflicts, Legislation, Prior appropriation.

The federal reserved water rights doctrine and some of the procedural and substantive problems which have arisen from its application, are discussed. The Note centers on the dual federal-state system for adjudicating such rights which presently exists in Colorado, and the potential for future inconsistencies in administering federal water rights in states like Wyoming. The procedural duality, resulting from the Akin decision, is unacceptable; federal legislative efforts are necessary in this area. Some flaws existing in proposed federal legislation are described with special examination given to the bill presently offered by the Department of Justice, Land and Natural Resources Division. In relation to substantive areas, the need for quantification of federal reserved water rights, as well as protection for present users of such rights, is indicated.
W79-02084

LAND USE AND RIGHTS IN GROUNDWATER. CASE NOTE, ALAMEDA COUNTY WATER DISTRICT V. NILES SAND AND GRAVEL CO., 37 CAL.APP. 3D 924, 112 CAL.RPTR. 846 (CT.APP. 1974), CERT. DENIED, U.S. 95 S.CT. 128 (1974),
Wyoming Univ., Laramie. Coll. of Law.
W. E. Bergholz, Jr.
Land and Water Law Review, Vol. X, No. 2, p 489-503, 1975. OWRT A-003-WYO(4), 14-31-0001-5051.

Descriptors: *Water law, Groundwater, *Water rights, *California, *Correlative rights doctrine, Prior appropriation, Jurisdiction.

In this case the California Court of Appeals imposed a 'public servitude' on a user of the overlying land in a groundwater basin. The Court then used this 'public servitude' to deny the user inverse condemnation for the flooding of his gravel pits. This Note explores the doctrine of correlative rights as it affects the use of land and water. In addition it discusses alternative methods to reach the result the Court in this case did in both a correlative rights jurisdiction and in prior appropriation jurisdictions.
W79-02085

AN EXAMINATION OF LEGISLATION FOR THE PROTECTION OF THE WETLANDS OF THE ATLANTIC AND GULF COAST STATES,
Mississippi Univ., University. School of Law.
A. J. Haueisen.
Gulf Research Reports, Vol. 4, No. 2, p 233-263, November, 1973.

Descriptors: *Legislation, *Wetlands, *Protection, Legal aspects, Atlantic coastal plain, Gulf coastal plain, Preservation, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas.

Wetlands are defined and the basic ecology of wetlands of this region discussed briefly. Federal laws and the laws of the coastal states are examined to determine what they have done to preserve and utilize these wetlands. A general categorization of the legal approaches various states have taken indicates the following: (1) legislation which enables a state to acquire wetlands or any easement, interest or rights, therein, (2) legislation which prohibits certain activities in wetland areas, (3) the Long Island (NY) Wetlands Act is unique in providing that the State may enter into cooperative agreements with counties to maintain wetlands and may furnish one-half of the cost of maintenance, and (4) legislation not directly related to wetlands but affecting flood plains. A legislation model for a wetlands act is provided and possible implementation of this proposed legislation discussed. (Stihler-Mass)
W79-02106

THE CONTROVERSY CONTINUES: STATE OWNERSHIP OF DRILL RIGS,
Indiana State Board of Health, Indianapolis
J. M. King.
Water Well Journal, Vol. 30, No. 12, p 63, December, 1978.

Descriptors: *Drilling, *State governments, *Monitoring, Water wells, Water quality, Groundwater.

The advantages of state ownership of drilling rigs are presented. Such ownership is the result of efforts to more effectively implement Federal legislation aimed at water resources protection, an obvious long-term benefit the water well industry. Without their own equipment state agencies must endure the paper work and delay that is usually involved in contracting with a private drilling firm. A significant amount of detailed and critical subsurface information is required where the wells are to be used for enforcement activities. Many water well drillers are neither trained nor equipped to conduct may of the types of logging, sampling and testing needed by regulatory agencies. Government involvement in well construction is limited mainly to water quality surveillance associated with specific enforcement cases and to the installation of scientific data-gathering devices. By actively engaging in preserving ground water quality the government is helping to secure the future of the water well industry. (Purdin-NWWA)
W79-02168

THE NEED FOR PROFESSIONALISM AND ITS ATTRIBUTES IN HYDROGEOLOGY,
R. J. Henning, and J. R. J. Studlick.
Ground Water, Vol. 16, No. 6, p 451-452, November-December, 1978.

Descriptors: *Professional personnel, Hydrogeology, *Employment, *Training, Organizations, Salaries.

Hydrogeology should be considered a profession comparable to engineering and medicine. To be a professional requires proper training, organization and recognition. The training of a hydrogeologist involves interdisciplinary studies and practical experience. The organizational requirement is met by NWWA. Recognition is the most difficult professional attribute to attain because it is subjective. This can be helped by requiring certification of hydrogeologists. Public acceptance and faith in hydrogeology can be gained by publishing more reports on ground water that are concise, clearly written, free of technical jargon, and available to the public at little or no cost. Attendance at professional meetings provides an opportunity to learn a great deal and improve professional confidence. Salaries for hydrogeologists should be on a part with that of engineers and geologists. The NWWA will survey, compile, and make available the facts of employment in the profession. More input is needed from professionals in the form of articles, suggestions and comments. (Purdin-NWWA)
W79-02174

GEOGRAPHIC ASPECTS OF THE TERRITORIAL REDISTRIBUTION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Inst. of Geografii.
For primary bibliographic entry see Field 4A
W79-02209

EVAPOTRANSPIRATION ESTIMATES FOR WATER RIGHT TRANSFERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2D
W79-02491

6F. Nonstructural Alternatives

WATER UTILIZATION AND REALLOCATION IN CHILE: A STUDY OF THE PIRQUE VALLEY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02053

DISASTER RESPONSE TO FLASH FLOOD,
Federal Water Pollution Control Administration, Denver, CO. South Platte River Basin Project.
For primary bibliographic entry see Field 8B.
W79-02193

NINE FALLACIES OF NATURAL DISASTER: THE CASE OF THE SAHEL,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 6B.
W79-02398

A NON-LINEAR PROGRAMMING APPROACH TO FLOODPLAIN MANAGEMENT WITH NON-STRUCTURAL ALTERNATIVES,
Massachusetts Univ., Amherst.
J. L. Kaul, and C. E. Willis.
Southern Journal of Agricultural Economics p 1-7, December 1975. 4 tab, 9 ref. OWRT B-043-MASS(6), 14-31-0001-5081.

Descriptors: *Floodplain management, Decision framework, *Non-structural alternatives, Methodology, *Regional analysis.

The objectives were: (1) to develop a methodology useful to planners at several levels for efficient floodplain management, considering both structural and non-structural measures, and (2) to demonstrate the usefulness of the methodology by applying it to selected floodplain (Farmington, Connecticut) in the Connecticut River Basin. The framework that is developed could provide information for improved decisions, and its applicability is demonstrated. In some regional situations, the variables designated as controls were not controllable under current institutional arrangements. In these cases, solutions can provide implications associated with the maintenance or alteration of these institutional structures.
W79-02400

EVAPOTRANSPIRATION ESTIMATES FOR WATER RIGHT TRANSFERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2D.
W79-02491

6G. Ecologic Impact Of Water Development

QUANTIFICATION, DECISION-MAKING AND ENVIRONMENTAL IMPACT ASSESSMENT IN THE UNITED KINGDOM.
Aberdeen Univ. (Scotland). Dept. of Geography.
R. Bisset.
Journal of Environmental Management, Vol. 7, No. 1, p 43-58, July, 1978. 3 fig, 2 tab, 31 ref.

Descriptors: *United Kingdom, *Environmental effects, *Decision making, *Planning, *Methodology, *Analytical techniques, Governments, *Environmental Evaluation System, Quantitative matrix system(Sphere), Land use, Cost-benefit analysis, Quantification, Economic development, Economics, Social values, *Evaluation.

Two methods of quantifying and aggregating environmental impacts for evaluating large-scale development projects or governmental policies are analyzed, and both are rejected because they tend to mask contentious issues, and can be used to control debate on the merit of proposals. The methods assessed are: (1) the Environmental Evaluation System (EES) developed for the U.S. Bureau of Land Reclamation, and (2) a quantified matrix developed by Sphere Consultants and used to rank sites for oil production platforms in Scotland. EES is based on a hierarchical checklist of 78 environmental parameters, each of which can be represented numerically. The parameters, each of which can be represented numerically. The parameters are assigned individual weights so that they can be compared and summed. The quantified matrix system, although fully quantified, is crude in comparison with EES. In the matrix, sites are listed horizontally (columns), while factors such as visual intrusion, reinstatement possibility, and land use destruction are listed vertically (rows). Construction impact at each site on all factors is shown by a subjectively derived number (0-5); factors all have equal weight. Ranking is achieved by simply summing columns. Subjective and unsophisticated weightings are then used to test the sensitivity of the ranking. While impact quantification is promoted as a means of countering economic arguments of developers, it is concluded that open discussion of impacts would not be aided by these methods, and their use in the United Kingdom should be opposed. (Lynch-Wisconsin)
W79-02028

NATURAL RESOURCES AND REGIONAL DISPARITIES: A SKEPTICAL VIEW,
For primary bibliographic entry see Field 6B
W79-02034

IS IT TIME TO DO A BENEFIT-COST ANALYSIS FOR THE LOCATION OF A POWER PLANT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics
For primary bibliographic entry see Field 6B.
W79-02054

NATURAL RESOURCES AND ENVIRONMENTAL RESTRICTIONS TO GROWTH,
Harvard Univ., Cambridge, MA.
E. Mason.
Challenge, Vol. 20, No. 6, p 14-19, January-February 1978.

Descriptors: *Natural resources *Scarcity, *Pollution abatement, *Costs, *Regulation, *Industrial production, History, Raw materials, Environment, Energy, Welfare(Economics), Economics, Public benefits, Political constraints, Developing countries, Externalities, Gross national product, Paley Commission

Economic costs and theoretical implications of environmental protection are assessed, and changing attitudes toward use of natural resources are traced. German efforts during World War II to boost military equipment production through substitution, redesign of equipment, collection of scrap, and paring of civilian requirements are used as an example of how metals shortages can be overcome. The Paley Commission Report of 1952 on U.S. national materials policy is also reviewed along with the issue of current materials scarcities and economic growth and the environment. The Paley Commission report concluded that the constraint to economic growth would not be physical limits of discoverable supplies, but rather the real costs of making those supplies available. The report said nothing about the desirability of protecting the environment, and therefore nothing about what such protection would cost. A United Nations study estimated that countries with per capita incomes above $2000 would have to spend 1.4-1.9% of GNP to attain U.S. air, water, and waste disposal standards. The U.S. spent 1.6% of GNP in 1974. Kneese estimates that with expenditures of 5% the GNP until the end of the century developing countries would greatly reduce residuals discharged to the environment, but 2.0-2.5% would seem more realistic; such a rate would mean a reduction in consumption of some goods and services. The world is not facing scarcities of industrial materials, nor even rising costs of such materials in the next century. (Lynch-Wisconsin)
W79-02056

A POLLUTED GOLDEN AGE,
Chicago Univ., IL.
For primary bibliographic entry see Field 5G.
W79-02071

ECONOMICS OF WILDERNESS RESOURCES,
For primary bibliographic entry see Field 6B.
W79-02072

AN EXAMINATION OF LEGISLATION FOR THE PROTECTION OF THE WETLANDS OF THE ATLANTIC AND GULF COAST STATES,
Mississippi Univ., University. School of Law.
For primary bibliographic entry see Field 6E.
W79-02106

THE PRODUCTIVITY OF LAKE CHAMPLAIN WIT REGARD TO WATERFOWL, FURBEARERS, AND OTHER WILDLIFE,
Vermont Dept. of Fish and Game, Montpelier.
For primary bibliographic entry see Field 2H.
W79-02114

YOU CAN TAILOR EFFLUENT BOD TO FIT THE RECEIVING-WATER ECOSYSTEM...AND ENHANCE THE ENVIRONMENT. URBAN AND FISH-PROCESSING WASTES IN THE MARINE ENVIRONMENT: BIOENHANCEMENT STUDIES AT TERMINAL ISLAND, CALIFORNIA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies
For primary bibliographic entry see Field 5E.
W79-02164

PLANNING FOR OFFSHORE OIL DEVELOPMENT. GULF OF ALASKA OCS HANDBOOK,
Alaska Dept. of Community and Regional Affairs, Juneau. Div. of Community Planning.
For primary bibliographic entry see Field 5G.
W79-02198

ENVIRONMENTAL IMPACT ASSESSMENT: AN AQUATIC BIOLOGIST'S POINT OF VIEW,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
C. E. Herdendorf.
Ohio Journal of Science, Vol. 78, No. 4, p 229-234, July 1978. 1 fig, 1 tab.

Descriptors: *Environmental effects, *Evaluation, *Water pollution effects, *Dredging, *Maumee River(OH), *Maumee Bay(OH), Water management(Applied), Scour, Benthos, Plankton, Bays, Rivers, Lakes, Great Lakes, Ohio, Lake Erie, Ecology, Ecosystems, Gravels, Sands, Methodology, Estuaries, Monitoring, Baseline studies, Sediments, Dissolved oxygen, Fish.

Evaluation of effects of sand and gravel dredging in the Maumee River estuary (Ohio) and Maumee Bay of Lake Erie exemplifies an environmental impact assessment which considers ecological factors. The assessment concludes that the overall impact of dredging activities in the aquatic ecosystem is minor, and the river/bay ecosystem would not be distinctly different in the absence of dredging. Prior to dredging initiation in April 1975 an extensive series of water quality and biological monitoring samples were collected at several sites and analyzed. Continued sand and gravel production would economically benefit the Toledo metropolitan area. Short-term negative effects include: (1) limited hydraulic and water quality impact, (2) minor noise and visual impact, and (3) reduction of benthic and planktonic life forms. Long-term adverse effects would be slight. Dredging would increase both river and bay depths and reduce river velocity, particularly during high runoff and floods, causing sedimentation of silt in excavations. In the bay, waves would break closer to shore, with increased scour 300-600 m from shore. Turbidity would temporarily increase, reducing light

penetration and depth of photosynthetic activity by phytoplankton. Planktonic organisms, including larval fish would be lost if entrained in dredge service water, and benthic forms would be eliminated at dredge sites. (Lynch-Wisconsin)
W79-02222

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02256

HYDROLOGY AND WATER BUDGETS OF CYPRESS DOMES,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
For primary bibliographic entry see Field 5B.
W79-02257

HYDROLOGIC BUDGET MODEL,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
For primary bibliographic entry see Field 2H.
W79-02258

HYDROLOGY OF THE AUSTIN CARY CONTROL DOME,
Florida Univ., Gainesville. Dept. of Geology; and Florida Univ., Gainesville, FL. Center for Wetlands.
For primary bibliographic entry see Field 5E.
W79-02260

CHANGES IN UNDERSTORY VEGETATION IN CYPRESS DOMES BROUGHT ABOUT BY FIRE AND ADDITION OF SEWAGE,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02263

COMPARATIVE STUDIES OF CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environemental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2H.
W79-02277

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W79-02389

EFFECTS OF AN ORGANIC ARSENICAL HERBICIDE ON A SALT MARSH ECOSYSTEM,
Auburn Univ., AL. Dept. of Biology; and Auburn Univ., AL. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W79-02427

ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS: SOIL RELATIONSHIPS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
J. L. McLeese, and E. P. Whiteside.
Journal of Environmental Quality, Vol 6, No 4, p 467-471, 1977. 2 fig, 4 tab, 9 ref.

Descriptors: *Wetlands, *Michigan, *Highway effects, *Drainage effects, Forests, Highways, Soil, Drainage, Soil erosion, Soil management, Hydrology.

Ecological effects of recent highway construction on soils, hydrology, vegetation, and wildlife have been cooperatively evaluated for some common woodland and wetland types in central lower Michigan. A soil inventory was prepared for each area and the highway's impact on the soils was determined. The most significant effects of highway construction on the soil environment were the erosion of soil materials and the alteration of natural soil drainage conditions. Wetland areas are most sensitive to highway construction activities. Natural soil drainage conditions and circulation patterns are easily disrupted at these sites. Methods for predicting potential soil loss and potential changes in natural soil drainage conditions due to highway construction activities are suggested. A soil map of each proposed highway corridor or alternative right-of-way should be available early in planning of proposed highway construction. The soil map can be useful in predicting construction impact on the associated hydrology, plants, and animals in the area. These, in turn, are basic information in evaluating the economic and social impacts of the proposed route on the communities involved. (Steiner-Mass)
W79-02429

PROCEEDINGS OF A WORKSHOP ON THE EVALUATION OF MODELS USED FOR THE ENVIRONMENTAL ASSESSMENT OF RADIONUCLIDE RELEASES.
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-02434

7. RESOURCES DATA

7B. Data Acquisition

SYSTEMATIC ABSORBANCE ERRORS WITH TECHNICON AUTOANALYZER II COLORIMETERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2K.
W79-02074

NEW METHOD FOR RECORDING HEART AND RESPIRATORY RATES IN CATFISH,
Georgia Inst. of Tech., Atlanta. School of Biology.
R. Strange, J. W. Dean, G. K. Dorman, and D. J. Fletcher.
Science of Biology, Vol. 1, No. 1, p17-18 May, 1975. 1 fig, 3 ref. OWRT B-088-GA(1), 14-31-0001-4071.

Descriptors: *Respiration, *Channel catfish, Fish physiology, *Catfish electrocardiograms.

A simple method of recording heart and respiratory rates in the channel catfish without utilizing implanted electrodes has been developed. This reduces the trauma and likelihood of infections developing from implanted electrodes.
W79-02077

PROCEDURE FOR THE EVALUATION OF ENVIRONMENTAL MONITORING LABORATORIES,
Tracer Jitco, Inc., Rockville, MD.
For primary bibliographic entry see Field 5A.
W79-02149

TELEMETRIC DETERMINATION OF SALMONID WINTER MICRO-HABITAT OCCUPATION AND MOVEMENT IN ICE-COVERED STREAMS,
Wyoming Univ., Laramie.
D. L. Wichers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 701, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, July 1978. 110 p, 19 fig, 9 tab, 58 ref, 3 append. OWRT B-038-WYO(1), 14-34-0001-8130.

Descriptors: *Salmonids, *Aquatic habitats, *Overwintering sites, Brown trout, Ice cover, *Wyoming, Streams, *Instream flow(Winter), Telemetry, *Tracking techniques, *Winter habitats(Trout).

In order to recommend suitable winter instream flows for Wyoming's medium-sized brown trout streams, research was conducted during the fall and winter season, 1977-1978, to determine winter microhabitat occupation preferences and movements of adult brown trout in a totally ice-covered Rocky Mountain stream. Surgically implanted radio transmitters were used for identifying pre-ice resting and feeding locations and resting, feeding, and cover locations during ice-cover. Parameters identified were water depth, mean velocity, point velocity, substrate type, cover type, and ice thickness, when present. Winter microhabitat preferences indicated that brown trout preferred shallower water depths with low mean velocities, under overhead ice-cover. Winter movement data indicated that brown trout have a period of increased activity, usually upstream, after initial ice-cover. Fish appeared to move to more preferred focal areas for over-wintering.
W79-02157

INSTRUMENTS FOR MONITORING THE QUALITY OF NATURAL AND WASTE WATERS,
For primary bibliographic entry see Field 5A.
W79-02214

FULL-SEASON RAIN GAUGE HAVING REPLACEABLE CHARTS FOR MAKING PROFILE GRAPHS,
C. F. Marley.
U.S. Patent No. 4,106,336, 3 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1009, August 15, 1978.

Descriptors: *Patents, *Rain gages, *Instrumentation, Rainfall, Charts, Weather data, Accumulated rainfall.

A full-season rain gauge for outdoor or partial outdoor installation comprises basically a weather-resistant vertically elongated panel, a season-height freeze-proof plastic tube, a shorter single-rain short-time-period plastic rain-gauge tube detachably mounted on the upper end of the season-height tube, and a one-season weather resistant chart for recording accumulated dated rainfall amounts and for subsequent side-by-side positioning to provide a successive-seasons profile graph. The shorter tube is removable after each rainfall or e.g. at weekly intervals. Its contents are then poured into the season-height tube, and the water height is marked and dated on the chart. The rain collector can be mounted at an elevated outdoor locations and can be connected indoors to the rain gauge proper by a small flexible hose. (Sinha-OEIS)
W79-02304

DEVICE FOR MEASURING PH AND TEMPERATURE OF A LIQUID, WHICH INCLUDES A MEMORY,
Dow Chemical Co., Midland, MI. (Assignee).
For primary bibliographic entry see Field 5A.
W79-02316

FLOW MONITORING,
For primary bibliographic entry see Field 8G.
W79-02330

REMOTE SENSING TECHNIQUES AND THE MONITORING OF DESERTIFICATION PROCESSES IN ARID AREAS,
Desert Inst. Ashkhabad (USSR).
N. G. Kharin.
In: Man and the Biosphere, Soviet Committee for the UNESCO Program, p 3-31, 1977. 5 tab, 7 fig

Descriptors: *Remote sensing, *Monitoring, *Aerial photography, *Desertification, Analytical techniques, Surveys, Terrain analysis, Climatolo-

gy, USSR, Radar, Hydrogeology, Geomorphology, *Turkmen SSR.

When studying the desertification of an area, it is necessary to identify manifestations of all forms of desertification, such as climatic processes (i.e. increases of aridity, reduction of water reserves caused by changes in the macro- and microclimates), hydrogeological processes (i.e. atmospheric precipitation becomes more scarce and the supply of groundwater episodic), morphodynamic processes (i.e. some geomorphological processes become more active including wind erosion of salts, water and wind erosion, transformation of fixed sands into moving sands, etc.), soil processes, phytogenetic processes, and zoogenetic processes, and global scale is discussed and illustrated here. Forming the basis of this analysis are the general principles governing the scale of photography, types of carrier, photographic zones, and methods of photography. Other types of aerial surveys, in particular radar and thermal, are discussed as well To illustrate these principles, the use of various techniques in the study of the desertification in the arid territories of Turkmenistan are described. (Tickes-Arizona)
W79-02390

QUANTITATIVE MAPPING BY REMOTE SENSING OF AN OCEAN ACID-WASTE DUMP,
National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W79-02407

7C. Evaluation, Processing and Publication

PUBLIC GROUNDWATER SUPPLIES IN KANE COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-02075

AN ATLAS OF VASCULAR PLANT SPECIES DISTRIBUTION MAPS FOR TIDEWATER MARYLAND,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2I
W79-02109

SOME COMPARISONS OF FLOOD STATISTICS IN REAL AND LOG SPACE,
Geological Survey, Reston, VA. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
For primary bibliographic entry see Field 2E.
W79-02119

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
D. E. Brown, N. B. Carmony, and R. M. Turner.
Arizona Game and Fish Department Map, 1978. 2 sheets, 171 ref.

Descriptors: *Arizona, *Streams, *Maps, Perennial streams, Intermittent streams, Base flow, Altitude, Wetlands, Aquatic faunas, *Drainage maps.

A map of Arizona (scale 1:1,000,000) documents much of what is known about the types of streams in the State. An accompanying list of references provides a ready guide to the literature on the streams. The map identifies perennial and intermittent streams, and generalized sources of base runoff; shows selected altitude contours of significance with respect to the aquatic faunas; and gives discharge ranges for unregulated streams. (Woodard-USGS)
W79-02121

DIRECTORY OF MEMBER ORGANIZATIONS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, RReston, VA. Water Resources Div.
For primary bibliographic entry see Field 10D.
W79-02123

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
J. D. Larson.
Open-file map 78-268, 1978. 2 sheets, 3 tab, 6 ref.

Descriptors: *Water quality, *Groundwater, *Maps, *Water analysis, *Chemical analysis, Data collections, *Virginia, Fairfax County(VA).

Two maps portray the chemical quality of ground water in Fairfax County, Virginia. One map shows dissolved-solids concentration and chemical analyses diagrams. The other indicates hardness and areas of marginal water quality. Three tables of chemical analysis representing the three distinct rock types in the county are presented also. (Woodard-USGS)
W79-02133

POTENTIAL FOR DOWNWARD LEAKAGE TO THE FLORIDAN AQUIFER, GREEN SWAMP AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. F. Grubb.
Water-Resources Investigations 77-71 (open-file report), 1978. 1 sheet, 6 fig, 1 tab, 10 ref.

Descriptors: *Groundwater recharge, *Leakage, *Sand aquifers, *Confined water, *Aquifers, *Maps, Aquicludes, Permeability, Porous media, Natural recharge, Geohydrologic units, Core drilling, Sampling, Mapping, Florida, *Floridan aquifers, *Green Swamp area(Fla)

A qualitative evaluation of the potential for downward leakage from the surficial sand aquifer to the underlying Floridan aquifer was made for the Green Swamp area (about 870 sq mi) in central Florida. Downward leakage, or recharge, is limited under natural conditions owing to the nearness to land surface of the potentiometric surface of both the sand aquifer and the underlying Floridan aquifer. Continuous cores of the unconsolidated section were obtained at 74 sites in the study area and were evaluated for downward leakage potential based on grain-size distribution. Sand percentage was estimated for each interval or bed from microscopic examination of the core samples. The four maps prepared from this data show sand thickness, clay thickness, relative vertical hydraulic conductivity of the confining beds and the relative potential for downward leakage. About 20 percent (178 sq mi) of the area classified has a relatively good potential for downward leakage; almost 50 percent of the area has a relatively poor potential. (Woodard-USGS)
W79-02136

FLOOD-PLAIN DELINEATION FOR CUB RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02137

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 611, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report WA-77-1, July 1978. 433 p, 22 fig.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Western Washington

Water resources data for the 1977 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells and springs. This report, in two volumes (western and eastern), contains discharge records for 258 gaging stations; stage only records for 4 gaging stations; stage and contents for 44 lakes and reservoirs; water quality for 162 stations and 7 lakes; and water levels for 173 observation wells. Also included are 146 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (See also W79-02139) (Woodard-USGS)
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 612, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report WA-77-2, July 1978. 419 p, 19 fig

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Eastern Washington.

Water resources data for the 1977 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells and springs. This report, in two volumes (western and eastern), contains discharge records for 258 gaging stations; stage only records for 4 gaging stations; stage and contents for 44 lakes and reservoirs; water quality for 162 stations and 7 lakes; and water levels for 173 observation wells. Also included are 146 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (See also W79-02138) (Woodard-USGS)
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 915, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report TN-77-1, July 1978. 550 p, fig.

Descriptors: *Tennessee, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites

Water-resources data for the 1977 water year for Tennessee consist of records of stage, discharge, and water quality of streams and springs; stage, contents, and water quality of lakes and reservoirs

nd water levels and water quality of wells. This eport contains discharge records for 105 gaging tations; stage only records for one lake gaging tation; elevation and contents for 27 lakes and eservoirs; water quality for 134 gaging stations, 99 artial-record flow stations, and 56 wells; and vater levels for 32 observation wells. Also includ- d are 116 crest-stage partial-record stations and 35 ow-flow partial-record stations. Other data were ollected and published for miscellaneous stream nd spring sites, or as seepage investigations of ischarge and water quality. These data represent hat part of the National Water Data System oper- ted by the U.S. Geological Survey and cooperat- ng State and Federal agencies in Tennessee. Woodard-USGS)
V79-02140

VATER RESOURCES DATA FOR GEORGIA, VATER YEAR 1977.
Geological Survey, Doraville, GA., Water Re- ources Div.
Available from the National Technical Information ervice, Springfield, VA 22161 as PB-287 732, rice codes: A17 in paper copy, A01 in microfiche. Vater-Data Report GA-77-1, July 1978. 375 p, 5 g.

Descriptors: *Georgia, *Hydrologic data, *Surface aters, *Water quality, Gaging stations, Stream- ow, Flow rates, Sediment transport, Water analy- s, Water temperature, Chemical analysis, Lakes, eservoirs, Water levels, Data collections, Sites.

Vater resources data for the 1977 water year for eorgia consist of records of stage, discharge, and ater quality of streams; and stage and contents of kes and reservoirs. This report contains discharge ecords for 100 gaging stations; stage for 9 gaging ations; stage and contents for 16 lakes and reser- oirs; water quality for 19 continuous stations and 10 periodic stations; and peak stage and discharge nly for 151 crest-stage partial-record stations. hese data represent that part of the National Vater Data System operated by the U.S. Geologi- l Survey and cooperating State and Federal gencies in Georgia. (Woodard-USGS)
V79-02141

OMPUTER ASSISTED INSTRUCTION IN ATURAL RESOURCE MANAGEMENT,
irginia Polytechnic Inst. and State Univ., Blacks- rg. Dept. of Fisheries and Wildlife Sciences. B. Titlow, and R. T. Lackey.
: Proceedings of the 26th Annual Conference of e Southeastern Association of Game and Fish ommissioners, p 500-505, 1972. 1 fig, 1 tab. WRT A-049-VA(2).

escriptors: *Simulation analysis, *Natural re- urces, Decision making, *Management, Natural source management, Trout.

eaching natural resources management is espe- ally difficult because of the importance of experi- ce in making management decisions. Most meth- ls for allowing natural resource students to gain anagement experience in the classroom have not en entirely satisfactory. Computer implemented nulation of natural resources problems allows ucators to provide management experience to udents. TROUT, a learning exercise which simu- es a coldwater lake fishery, is discussed as an ample of the role of these teaching tools.
79-02161

IGH PLANS - OGALLALA GROUNDWATER TUDIES,
ansas Water Resources Board, Topeka.
r primary bibliographic entry see Field 4B.
79-02172

UBSURFACE STRATIGRAPHY AND WATER ESOURCES OF CASS COUNTY, INDIANA,
rdue University West Lafayette, Indiana. De- rtment of Geosciences.
r primary bibliographic entry see Field 4B.
79-02185

A NON-LINEAR PROGRAMMING APPROACH TO FLOODPLAIN MANAGEMENT WITH NON-STRUCTURAL ALTERNATIVES,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 6F.
W79-02400

HAZARDOUS MATERIAL SPILLS: A DOCUMENTATION AND ANALYSIS OF HISTORICAL DATA,
Factory Mutual Research Corp., Norwood, MA.
For primary bibliographic entry see Field 5G.
W79-02411

8. ENGINEERING WORKS

8B. Hydraulics

TWO DRILLING METHODS COMPARED,
Schultes (A. C.) and Sons, Inc., Woodbury, NJ.
J. F. Schultes, Sr.
The Johnson Drillers Journal, p 2-4, September-October, 1978. 4 fig.

Descriptors: *Drilling, *Water wells, Rotary drilling, Reverse circulation drilling, Specific capacity, Well efficiency, Drawdown, Aquifer tests, *Maryland, *Piney Point aquifer(MD).

Two drilling methods were employed for two wells in the Piney Point aquifer in Maryland which is a non-uniform sand aquifer. The first well was drilled using the mud rotary method. After development its specific capacity was 94 gpm per foot of drawdown which indicates a well efficiency of only 38.3 percent. The second well was drilled using the reverse circulation method and the diameter was increased from 18 to 24 inches. A controlled 24 hour pumping test resulted in a specific capacity of 16.6 gpm per foot of drawdown which indicates that the well efficiency of only 38.3 percent. The second well was drilled using the reverse circulation method and the diameter was increased from 18 to 24 inches. A controlled 24 hour pumping tests resulted in a specific capacity of 16.6 gpm per foot of drawdown which indicates that the well attained an efficiency of almost 100 percent. It was concluded that the reverse circulation drilling method was responsible for the higher efficiency of the second well because it cleans the fine particles of sand from the wall of the hole. (Purdin-NWWA)
W79-02169

REDOX POTENTIAL MEASUREMENTS AS AN INDICATION OF BIOCHEMICAL WELL PLUGGING,
Ground Water Associates, Inc., Arlington, MA.
For primary bibliographic entry see Field 5A.
W79-02170

WATER SYSTEMS BASICS, (1),
For primary bibliographic entry see Field 8C.
W79-02180

DISASTER RESPONSE TO FLASH FLOOD,
Federal Water Pollution Control Administration, Denver, CO. South Platte River Basin Project.
R. L. Berling.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 104, No. WR1, Proceedings Paper 14111, p 35-44, November 1978. 9 fig.

Descriptors: *Flash floods, *Colorado, *Disasters, Diversion, Flood control, Rain, Flood data, Floods, Precipitation(Atmospheric), Rainfall, Projects, Storms, *Rocky Mountain National Park, *Emergencies, *Big Thompson River Canyon, Diversion works, Emergency reporting systems.

Extremely heavy rainfall occurred in the Big Thompson River Canyon of Colorado on July 31, 1976. The severe flash flood, which developed in a few hours, claimed 145 lives and caused nearly $40,000,000 in property damage. Several features of the Colorado-Big Thompson water diversion project, located on the river system, played an important role in preventing even greater damage and loss of life. The project operational alert to the disaster came from the personal observation of heavy rainfall and measurement of flood flow in the Estes Park area. Based upon the observed conditions and best judgement, immediate action was taken to place the project system into an emergency mode of operation. A broad-scale program of restoration of water and power facilities was initiated on August 1. A critique of the operation provided first hand experience that could be of value to other water resource managers. (Roberts-ISWS)
W79-02193

OXYGEN TRANSFER AT HYDRAULIC STRUCTURES,
Watson (J. D. and D. M.), London (England).
For primary bibliographic entry see Field 5G.
W79-02202

PRACTICAL RIPRAP DESIGN,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
S. T. Maynord.
Miscellaneous Paper H-78-7, June 1978. 74 p, 24 fig, 10 tab, 2 pl, 14 ref.

Descriptors: *Riprap, *Design, *Design criteria, *Sheer stress, *Shield's design, Engineering structures, Bank stabilization.

Determination of stable riprap size is a problem that has been studied extensively but not yet solved. Existing design methods are based the shear stress exerted by the flowing water on the channel boundaries. The various methods available for computing the shear stress do not agree. Determination of the amount of shear stress a given size riprap can withstand depends upon which investigator's coefficient is used in the Shields' equation. The objective of this investigation was to develop a riprap design procedure based on known or easily calculated variables that properly describes ripra stability. Model tests of riprap stasbility were used in this investigation to insure that the proposed design procedure is applicable to the higher turbulence levels found in decelerating flow in open channels. Design curves for bottom riprap and side slope riprap in straight channels are presented. Tentative criteria for riprap in channel bends are discussed. (WES).
W79-02351

BAY SPRINGS CANAL SURGE STUDY, TENNESSEE-TOMBIGBEE WATERWAY, MISSISSIPPI AND ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. H. Tate, Jr.
Technical Report H-78-9, June 1978. 26 p, 7 pl.

Descriptors: Model studies, *Locks, *Surges, *Tennessee-Tombigbee Waterway(Ala-Miss), Hydraulic models, *Bay Springs Canal(Miss), Mississippi, Alabama.

A 1:80-sale hydraulic model was used to study flow conditions in the canal downstream of the proposed Bay Springs Lock. The original design ad plan of operation caused severe conditions in the canal and required modification of the lock discharge system ad lower approach geometry. Based on the results of this study, the design 2 diffuser and lower approach with a 2-min emptying valve schedurle should provide satisfactory navigation conditions downstream of the project. This design is expected to produce a relatively slow upwelling of the water surface in the lower approach with a maximum height of 2.5 ft and to exert a force of less than 36 tons on a tow similar to that used in the study. (WES)
W79-02352

PHYSICAL MODEL SIMULATION OF THE HYDRAULICS OF MASONBORO INLET, NORTH CAROLINA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. A. Sager, and W. C. Seabergh.
General Investigation of Tidal Inlets (GITI) Report 15, November 1977. Conducted jointly with U.S. Army Coastal Engineering Research Center, Fort Belvoir, Virginia. 552 p, 5 tab, 105 photos, 349 pl, 9 ref.

Descriptors: *Hydraulic similitude, *Hydraulic models, Model studies, *Masonboro Inlet(NC), Fixed-bed models, *Simulation analysis.

Masonboro Inlet was selected as an inlet to determine the usefulness and reliability of physical and mathematical models in predicting hydraulic characteristics of inlet/bay systems. Results obtained from the physical model study are presented. Masonboro Inlet fixed-bed model, constructed to scales of 1:300 horizontally and 1:60 vertically, reproduced an area extending to the -45 ft contour in the Atlantic Ocean and to the nodal points in each interior channel. After model verification tests proved satisfactory, a detailed examination of the effects of waves on model current and tidal height data was made. After testing the 1969 condition, the model was remolded to the November 1964 condition, which represents a time preceding the construction of improvements--a north jetty, a deposition basin, and a dredged channel. Base data were collected, then the improvements were installed upon this condition and tests were run to predict the effect of the improvements on tidal elevations, tidal currents, and wave-induced currents. Fixed-bed model predictions of filling of the dredged navigation channel, filling of the deposition basin, and a tendency for the navigation channel to shift toward the north jetty were substantiated by comparison with the 1966 model results and with prototype data. (WES)
W79-02353

SHOALING CONDITIONS IN SAWYER BEND AND LOWER ENTRANCE TO CHAIN OF ROCKS CANAL, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. E. Foster, C. M. Noble, and J. J. Franco.
Technical Report H-78-7, June 1978. 68 p, 24 pl, 11 fig.

Descriptors: *Channel improvement, *Sediment transport, *Mississippi River, *Hydraulic models, *Shoaling, *Moveable-bed models, *Sawyer Bend(Mo-Ill), *Chain of Rocks Canal(Mo-Ill), Missouri, Illinois.

Investigates the development of an adequate channel and access to the docking facilities along the right bank in Sawyer Bend and the reduction or elimination of shoaling in the lower entrance to the Chain of Rocks Canal. Shoaling in the lower entrance to the canal during low flows has created a serious problem because of the amount of dredging required and the lack of suitable disposal areas. The purpose of the model study was to develop plans that would provide a satisfactory channel in Sawyer Bend and reduce or eliminate the need for dredging in the lower entrance and approach to the Chain of Rocks Canal. A movable-bed model, constructed to scales of 1:250 horizontally and 1:100 vertically, reproduced the Mississippi River and adjacent overbank areas between miles 191.0 and 180.5. Results indicate development of a satisfactory channel in Sawyer Bend can be accomplished by reducing the amount of flow through the chute channel to the left of Mosenthien Island and forcing the channel to cross toward the right band farther upstream. This could be accomplished with the plan developed on the model and at the same time maintain some flow in the chute channel during all river stages. (WES)
W79-02354

A HYDRAULIC INSTALLATION IN THE WATER SUPPLY SYSTEM OF EMMAUS-NICOPOLIS,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 4A.
W79-02394

THE WATER SUPPLY SYSTEM OF CAESAREA MARITIMA,
Y. Olami, and Y. Peleg.
Israeli Exploration Journal, Vol. 27, No. 2-3, p 127-137, 1977. 7 fig, 27 ref.

Descriptors: *Aqueducts, *Paleohydrology, *Hydraulic design, *Structural analysis, *History, Archaeology, Water resources development, Structural design, Construction, Adaptation, Conveyance structures, Dams, Dating, Israel, Water control, Diversion structures.

The water supply system of ancient Caesarea, first described by the Palestine Exploration Fund Survey in the 1870's, is analyzed here. The system is comprised of two distinct water lines, high level and low level aqueducts. The first was fed by two sources, the Shumi springs near the old Roman theater at Miyamis, north of Binyamina, and the springs of the Ammiqam-Avi'el area about 7.5 km northeast of Miyamis. This double-structured aqueduct actually is comprised of two aqueducts joined laterally to accommodate two parallel channels. The low level dam starting at Nahal Tanninim dam near Ma'agan Mikhael is designed to exploit the hundreds of springs from 3.5 to 4m above sea level to the height of at least 5.5 m required to deliver the water to Caesarea. Examination of the entire system reveals evidence of various phases of construction, modification, and repair. The eastern and most ancient part of the system was constructed during Herodian times, followed shortly thereafter by the construction of the western aqueduct, perhaps during the time of Hadrian. The exact dating and chronology for the construction of the component parts of the system are subjects of speculation and argued here. Caesarea and its water supply system was conquered and laid waste by the Mameluke Sultan Baybars in A.D. 1265. (Tickes-Arizona)
W79-02399

8C. Hydraulic Machinery

WATER SYSTEMS BASICS, (1),
E. A. Scott, Jr.
Ground Water Age, Vol. 13, No. 2, p 17-19, October, 1978. 3 fig.

Descriptors: *Water supply, *Water wells, *Pumps, Water sources, Driven wells, Drilled wells, Bored wells, Dug wells, Water pollution, Suction force, Atmospheric pressure, Centrifugal force, Impeller, Shallow wells.

Ground water is preferable to surface water as a source of potable water for private supply systems. It is drawn from wells of various types such as: driven wells, drilled wells, bored wells, and dug wells. Construction techniques and equipment and safety measures against contamination are described for each type of well. Two basic principles involved in pumping of water from wells are: suction force, which is the result of atmospheric pressure, and centrifugal force. Theoretically, suction force could lift water 33.9 feet, but practically, 25 feet is the maximum lift of suction-type pumps. In wells deeper than 25 feet, centrifugal force must be used to bring water to the surface. Centrifugal force underlies the operation of all common water systems pumps--jets, submersible, turbines. In practice, the pump creates centrifugal force with a bladed wheel known as an impeller. Water enters the pump housing and flows outward from the axis. This flow creates a partial vacuum or suction, which brings additional water in through the intake. In simplest form, the intake is connected to the drop pipe into the well. However, this is suitable only for very shallow wells - 15 feet or less. For greater depths a jet pump is commonly used. (See also W79-02181) (Purdin-NWWA)
W79-02180

WATER SYSTEMS BASICS, (2),
A. E. Scott, Jr.
Ground Water Age, Vol. 13, No. 3, p 15-19, November, 1978. 4 fig.

Descriptors: *Jet pumps, *Submersible pumps, *Storage tanks, Water wells, Pumps, Water supply systems, Lightning arresters.

Basic water system pumps and accessories are described in detail. Jet pumps utilize an ejector which draws water continuously through a partial vacuum. They are classified as shallow-well, deep-well, convertible, multi-stage or verticle. Submersible pumps are the fastest growing type. Every submersible has a series of stages arranged on a common shaft. Each stage consists of an impeller and a diffuser. The motor is submerged in the well along with the pump. Submersibles are quiet and ideal for deep wells. Submersible pumps are classified according to diameter, number of electrical cables, and motor design. There are three basic motor types: Hermetically sealed, oil-filled, and non-hermetic waterfilled. Other types of pumps include: piston pumps, working head, and vertical turbine. Pressure tanks store water from the well. Air would waterlog the tank if not controlled by a valve, tank float, or diaphragm. Pressure tanks should be equipped with a pressure switch, pressure gage, relief valve, liquid level control, and foot valve. Wells should be protected from contamination with a well seal or pitless adapter. Lightning arresters protect pump from high voltage surges during thunderstorms. (See also W79-02180) (Purdin-NWWA)
W79-02181

THE IMPACT OF THE USE OF HEAT PUMPS ON GROUNDWATER TEMPERATURES,
Northern Cheyenne Research Project, Lame Deer, MT
For primary bibliographic entry see Field 4B.
W79-02192

DRIVE DEVICE FOR RAKE ARM WITH ATTACHED SCREEN COMB IN CLEANING DEVICE FOR A WATER CONDUIT SCREEN,
Schrieber GmbH and Co KG, Langenhagen (West Germany). (Assignee).
S. Rudolph, J. Noring, and A. Schreiber.
U.S. Patent No. 4,107,040, 8 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1247, August 15, 1978.

Descriptors: *Patents, *Cleaning, *Screens, *Filters, Conduits, Conveyence structures, Suspended solids, Equipment, Screen rake.

Devices for the cleaning of screens which are located in a water conduit include a screen rake capable of being moved from an intermediate or rest position above the water surface into a meshing position with the screen, and then into a substantially horizontal position above a collecting bin for emptying. The object of the invention is the development of an improved cleaning device where as low a structural height of the device as possible is maintained, and where the rake arm is operated by a simple, trouble-free mechanical control arrangement. The screen rake is mounted and driven by a chain to be guided in a path so that the screen comb cleans the screen, deposits the screenings in a bin and returns to clean the screen again in a continuous and non-interrupted fashion. The path is formed by a number of connected angle bars which are curved in shape and which are placed between a number of chain wheels around which the chain is wrapped for movement.
W79-02306

HYDRAULIC MODEL TESTS OF THE PROPOSED WEIR FOR THE RICHELIEU RIVER AT ST. JEAN, QUEBEC,
Canada Centre for Inland Waters, Burlington (Ontario)
P. Engel, and Y. L. Lau

Unpublished Report, Canada Centre for Inland Waters. March, 1977. 22 p. 12 fig, 3 tab, 2 ref.

Descriptors: *Hydraulic models, *Weirs, *Discharge coefficient, Model studies, Design, Engineering, Hydraulic similitude, Testing, Engineering structures.

A model of a proposed weir for the Richelieu River was constructed and tested to obtain the stage-discharge relationship and to investigate if the control of the tailwater level will affect the discharge coefficient. It was found that the discharge coefficient was not affected for flows lower than about 40,000 cu ft/sec. Two modifications of the weir were tested. Both showed significant reduction in scour of the river bed as compared with the original weir design. A horizontal extension of the weir is the recommended modification. The rip-rap protection was designed and tested and found to be stable for the weir with the recommended extension. (Steiner-Mass)
W79-02414

8D. Soil Mechanics

LIQUEFACTION POTENTIAL OF HYDRAULIC FILLS,
Army Engineer District, Los Angeles, CA.
R. M. Pyke, L. A. Knuppel, and K. L. Lee.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT11, Proceedings Paper 14133, p 1335-1354, November 1978. 9 fig, 1 tab, 29 ref.

Descriptors: *Landfills, *Seismic design, *Harbors, *California, Earthquakes, Land use, Dikes, Shore protection, Laboratory tests, Density, *Los Angeles(Calif), *Long Beach(Calif), Hydraulic fills, Liquefaction.

The potential for future earthquake-induced liquefaction in the hydraulic fills of this important harbor area was examined with the aid of several recently proposed detailed and simplified procedures. In addition, the validity of these procedures was assessed by applying them in liquefaction analysis of the hydraulic fills existing in the harbor during the 1933 Long Beach Earthquake. The study suggested that there is something less than a 50% chance of liquefaction occurring during the useful lifetime of these facilities. The consequences of liquefaction will depend on the nature of land at the time. (Visocky-ISWS)
W79-02203

CONSTRUCTION AND OPERATION OF LOW-PRESSURE DAMS ON PERMAFROST SOILS,
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 253, Price codes: A03 in paper copy, A01 in microfiche. Draft Translation 625, July 1977. 25 p, 7 fig, 2 tab, 2 ref.

Descriptors: *Cold weather construction, *Dams, *Earth dams, *Permafrost, Soils, Frozen soils, Freezing, Thawing, Infiltration, Cold regions, Structures, Hydraulic structures, Construction, Reservoirs, Reservoir operation, Engineering, Civil engineering, *USSR.

During the construction and operation of frozen dams, frozen soils may be used for the foundation. However, the foundation soils must not be allowed to thaw. Filtration through the body and foundation of a dam should be completely precluded. Otherwise, losses of the filration resistance and overall strength of the facility will occur. The requirement of ensuring against filtration through the body and foundation of a dam and its abutment with the spillway also must be observed during the construction of dams by the thaw method. Filration eventually promotes the formation of a thaw zone, increased filtration, velocity, and the overall stability of a dam on rocky soil is lost. During the construction of dams on ice-saturated sedimentary soils, the latter must be completely stripped from the foundation if their thickness is insufficient, and replaced with high-quality soils. If the thickness of ice-saturated soils is substantial, then the core of the dam must be filled with less ice-saturated soils. The latter should cut completely through the ice-saturated soils. The dimensions of the spillway should be determined on the basis of careful analysis of the hydrological mode of the stream. Wherever relief permits, the spillway should be built outside of the front created by the dam. Otherwise, filration may occur, altering the thermal mode of the facilities, resulting ininevitable losses of filration resistance. (Sims-ISWS)
W79-02220

8E. Rock Mechanics and Geology

STUDY OF RIVER MEANDERING IN THE SEARCH FOR TECTONIC STRUCTURES (AS EXEMPLIFIED BY THE MIDDLE DNIESTER REGION),
V. Ya. Yeromenko, and V. P. Ivanov.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 9-14, 1977. 4 fig, 3 tab, 18 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 237, p 131-140, 1977.

Descriptors: *Rivers, *Meanders, *Geomorphology, *Structural geology, Analytical techniques, Aerial photography, Geology, Fractures(Geologic), Foreign research, Foreign countries, *USSR, *Dniester River(USSR).

Analysis of river meandering was used to study recent tectonic movements and to identify growing or subsiding crustal structures. River meandering was studied from aerial photographs for the purpose of obtaining information on the morphology and hydraulics of channel flows. According to this method, the rivers are divided into morphologically homogeneous reaches (free meandering, limited meandering, channel processes of the side- and midstream-bar type, rapids, etc.), their quantitative characteristics in the selected reaches are obtained, and their behavior is computed and forecast (change in channel configuration, direction and speed of sediment movement, etc.). The morphometric description of a river reach includes determination of its length, average channel slopes, width of the flood plain and channel, depths, curvature of the river (radius of curvature of the axial line of the channel), the amplitude and length of meanders, number of loops, etc. The investigations showed that some of the meander nodes on the Dniester River and most of the meanders of its middle course tributaries occur in the fracture zones of the crystalline basement lying at a depth to 400 m. (Humphreys-ISWS)
W79-02205

ACID MINE DRAINAGE AND SUBSIDENCE: EFFECTS OF INCREASED COAL UTILIZATION,
Industrial Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5G.
W79-02409

8F. Concrete

STRENGTH AND BEHAVIOR OF THICK WALED REINFORCED CONCRETE CONDUITS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Ceramic Engineering.
G. C. Ruzicka, W. L. Gamble, and B. Mohraz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 250, Price codes: A09 in paper copy, A01 in microfiche. Report UILU-ENG-76-2004, May 1976. 193 p, 127 fig, 10 tab, 16 ref. DACW-73-72-C-0065.

Descriptors: *Conduits, *Culverts, *Reinforced concrete, *Laboratory tests, Strength, Strength of materials, Testing, Cracks, Reinforcement, Reinforcing steel, Concrete, Hydraulic structures, Concrete structures, Dams, Earth dams, Beams(Structural), Finite element analysis, Engineering, Civil engineering, *Box culverts.

The results of tests of 8 three-opening reinforced concrete conduits designed for soil loadings of 30 k/sq ft were presented and discussed. The test specimens were 3/8 scale models of prototype designs, and were constructed with conventional deformed bars and concrete with 1-inch aggregate. The clear span-depth ratios in critical members ranged from 2.5 to 5.6. External loads were applied in both vertical and horizontal directions simultaneously, so that significant thrusts were acting in all members in addition to the bending and shear forces. Failure loads ranged from 82.5 to 150 k/sq ft vertical load for members with span-depth ratios of 4.0 or less. Horizontal loads of 60 to 75 k/sq ft produced failures in members with span-depth ratios of 5.6. All members failed in shear. A lower bound to the test data was suggested as a function of sq root of (f sub c prime), the span-depth ratio, and the longitudinal compression acting on the member. No strong influence of the reinforcement ratio was found. When other test results were compared, there did not appear to be a strong influence of the moment-shear ratio as expressed by the variable Vd/M. (Sims-ISWS)
W79-02217

DESIGN AND PROOF TEST REQUIREMENTS FOR PRECAST REINFORCED CONCRETE BOX CULVERTS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
H. M. F. Ghanem, and J. P. Lloyd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 297, Price codes: A06 in paper copy, A01 in microfiche. Report FHWA-RD-77-S0613, March 1977. 100 p, 41 fig, 9 tab, 20 ref.

Descriptors: *Culverts, *Reinforced concrete, *Laboratory tests, Strength, Strength of materials, Testing, Cracks, Concrete, Conduits, Hydraulic structures, Drains, Surface drainage, Design, Reinforcement, Reinforcing steel, Engineering, Civil engineering, *Box culverts, Crack control, Proof tests.

The accuracy of a proposed proof test for single cell box culverts was verified by testing 16 full-size specimens. The proof test involved placing a symmetrical arrangement of concentrated loads against the upper and lower slabs. The measured strength was compared to that predicted by yield line theory. It was shown that for culverts reinforced with welded wire fabric, the plastic moment capacity should be used on the tensile strength of the wire. For culverts reinforced with deformed bars, the plastic moment could be based on the yield strength of the reinforcement; however, because of strain hardening, the proof test procedure occasionally underestimated the actual capacity. It was found that the proof test could detect significant deficiencies in either sytle of flexural reinforcement. Efforts to develop a nondestructive proof test based on crack width were unsuccessful. An ancillary study involving 24 beams considered the influence of reinforcement sytle on the width of flexural creacks under sustained loading conditions. It was found that deformed bars provided significantly better crack control than smooth welded wire fabric. (Sims-ISWS)
W79-02218

8G. Materials

DRILLERS FIND INCREASING USE FOR PLASTIC PIPE,
Universa Oil Products, St. Paul, MN. Johnson Div.
J. S. Miller.
The Johnson Drillers Journal, p 5-6, September-October, 1978.

Descriptors: *Well casings, *Plastic pipes, *Well construction, Pressure, Hydrostatic design stress, Corrosion.

Increasing use of plastic casing and screens in water wells is due to their immunity to corrosion, ease of assembly and cutting, light weight, high strength-to-weight ratio, and low cost. However, plastic casing can only be installed in holes that have been drilled by rotary or auger methods since it can't be driven. Plastic casing also requires special handling to avoid knicks, scratches and bends. Since plastic has a lower collapse strength improperly installed gravel pack can cause the casing to collapse. Each diameter of plastic casing is available in a number of wall thicknesses and consequently different interior diameters. There are numerous plastic materials available of various types, grades, and design stress. A formula to determine the pressure rating for any plastic casing is given and the procedure for proper field assembly is discussed. Plastic pipe will never fully replace steel casing but it is another special, useful tool for the professional driller, and another forward step for the well drilling industry. (Purdin-NWWA)
W79-02177

THE DOWNHOLE TV CAMERA CAN 'SEE' WHAT'S WRONG,
Well Surveys Co., Hereford, TX.
R. P. Coneway, and S. Coneway.
The Johnson Drillers Journal, p 1, 12, September-October, 1978.

Descriptors: *Borehole camera, *Water wells, *Subsurface investigations, Inspection, Surveying instruments, Photography.

The downhole, closed-circuit TV camera permits visual inspection of open bore or core holes above and below water. Problems that are pin-pointed include: casing damage or ruptures, encrusted screen areas, corrosion effects, and foreign objects. Accurate pictures can be obtained at depths of 2500 feet under 900 psi in holes as small as 3 1/2 inches. The survey is recorded on video tape with an audio narrative explaining it. The downhole camera is particularly valuable in the redevelopment and rehabilitation of older wells. However, newly completed wells should be surveyed and yearly maintenance and redevelopment programs for municipal, industrial and government wells should specify a survey. (Purdin-NWWA)
W79-02178

A NOTE ON PACKER, SLUG, AND RECOVERY TESTS IN UNCONFINED AQUIFERS,
Tel-Aviv Univ. (Israel). School of Engineering.
G. Dagan.
Water Resources Research, Vol. 14, No. 5, p 929-934, October, 1978. 3 fig, 1 tab, 4 ref.

Descriptors: *Packer tests, *Slug tests, *Recovery tests, *Unconfined aquifers, *Permeability, Hydraulic conductivity, Aquifer characteristics, Aquifer testing, Flow, Numerical analysis, Computer models.

Packer, slug and recovery tests determine the permeability of unconfined aquifers of low hydraulic conductivity. Storativity plays a negligible role since water injected or removed from the wells is of small enough quantity that the water table remains horizontal and the flow steady. The ratios of well length (L) to well radius (rw) and head (H) to rw are larger, while the permeability is low. It is assumed that the formation is homogeneous near the well. Simple computer programs, the method of determining permeability, and graphs applicable to a wide range of parameters are discussed. The flow problem is solved by source distribution along the well axis. This method can be used for more complex configurations such as packer tests in wells inclined with respect to the vertical. The main limitation of the method is the requirement that the length of the active part of the well should be much larger than the well radius. (Purdin-NWWA)
W79-02179

INNOVATIVE WATER SYSTEM SOLVES QUALITY PROBLEM,
Tacoma Dept. of Public Utilities, WA. Water Div.
For primary bibliographic entry see Field 5G.
W79-02183

TIRE MODULE SYSTEMS IN SHORE AND HARBOR PROTECTION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. M. Armstrong, and R. C. Petersen.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW4, Proceedings Paper 14182, p 357-374, November 1978. 13 fig, 2 tab, 8 ref.

Descriptors: *Breakwaters, *Shore protection, *Costs, *Protection, Damages, Erosion control, Erosion, Filrers, Harbors, Lakes, Construction, Retaining walls, *Tires, *Modular structures, Cloth, Ice pressure, Waste recycling, Wave damping.

Experimental testing indicated the potential value of using discarded tires as a construction material for low cost shore and harbor protection. The modular assembly methods and use of available connecting materials were examined for an 18-tire module. Engineering design parameters, material cost, and field tests for both floating tire breakwaters and tire revetments were summarized. Floating tire breakwaters were described that provide wave attenuation in marinas and small harbors in both slat and freshwater. Descriptions of two tire revetment test sites on the Great Lakes were presented. Limited monitoring efforts showed that the concept of tire revetment mats seems to hold promise as a low cost approach to certain shore erosion problems. (Roberts-ISWS)
W79-02201

STUDY OF RIVER MEANDERING IN THE SEARCH FOR TECTONIC STRUCTURES (AS EXEMPLIFIED BY THE MIDDLE DNIESTER REGION),
For primary bibliographic entry see Field 8E.
W79-02205

STRENGTH AND BEHAVIOR OF THICK WALED REINFORCED CONCRETE CONDUITS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Ceramic Engineering.
For primary bibliographic entry see Field 8F
W79-02217

DESIGN AND PROOF TEST REQUIREMENTS FOR PRECAST REINFORCED CONCRETE BOX CULVERTS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 8F.
W79-02218

DRIVE DEVICE FOR RAKE ARM WITH ATTACHED SCREEN COMB IN CLEANING DEVICE FOR A WATER CONDUIT SCREEN,
Schrieber GmbH and Co. KG, Langenhagen (West Germany). (Assignee).
For primary bibliographic entry see Field 8C.
W79-02306

FLOW MONITORING,
C. A. McClure.
U.S. Patent No. 4,111,044, 7 p 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 974, no 1, p 76, September 5, 1978.

Descriptors: *Patents, *Monitoring, *Measurement, Channels, Open channels, Flow, Channel flow, Flow characteristics, Pneumatic action.

This invention relates to monitoring of liquid flow in a channel open to the atmosphere by means requiring no electrical power. The objects of the invention are accomplished, in a method of monitoring flow in an open channel, by pneumatically sensing pressure of overlying liquid in the channel as depth of such liquid trasmitting changes in the sensed depth at the instance of pneumatic energization of means for doing so, characterizing depth as flow of liquid in the channel, and indicating such liquid flow. The pressure sensing and the transmittal of changes in sensed depth are accomplished pneumatically, via a bubbler tube and bellows plus self-balancing cam-and-valve means for controlling rotation of an air motor. (Sinha - OEIS)
W79-02330

NOVEL COMPOSITIONS OF MATTER FOR USE IN THE TREATMENT OF AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W79-02335

OPTIMIZATION AND TESTING OF HIGHWAY MATERIALS TO MITIGATE ICE ADHESION,
Washington State Univ., Pullman
M. Krukar, and J. C. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 927, Price codes: A08 in paper copy, A01 in microfiche. Interim Report No EPA-600/2-78-035, March 1978. 156 p, 38 fig, 62 tab, 22 ref, 3 append. R-804660

Descriptors: *Highway icing, *Paving, *Asphalt, *Materials testing, *Rubber, Laboratory tests, Paints, Freeze-thaw tests, Road construction, Pollution, Toxicity, Ice breakup, Deicers, Snow removal, Pullman, Washington.

The continued development of cost-effective highway coatings, which would reduce the adherence of ice on pavement surfaces is discussed. Formulations of paint/DC 732, DrisSil 73/DC 732, Petroset AT, and Viscopin B were selected on the basis of tests concerning the magnitude and stability of their contact angles, ice release abilities on asphalt and concrete, skid resistance levels on asphalt, durability/wear properties on asphalt and concrete, and environmental contamination potentials Petroset AT and Viscospin B were applied in two concentration levels in 1.6-in asphalt overlays on the Washington State University (WSU) Test Track for laboratory testing. Data obtained from the WSU Test Track includes: air and surface temperatures; visual observations of water beading and ice release; photographs of coating and substrate conditions; and coating skid values. Various combinations of tire types were used to study their effects. Due to the mild 1976-77 winter, tests were limited, but the data did allow a ranking of the coatings. The three rubberized asphalt sections and the two Petroset asphalt sections were most effective; the best rubberized asphalt section showed reduced abrasion resistance, thus negating its other performance. Petroset, the only formulation deemed toxic, also showed high hydrocarbon runoff levels. It is recommended that more testing be done to confirm the results, to compare existing snow/ice control methods, and to obtain additional traffic wear data. (Davison-IPA)
W79-02408

HYDRAULIC MODEL TESTS OF THE PROPOSED WEIR FOR THE RICHELIEU RIVER AT ST. JEAN, QUEBEC,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 8C.
W79-02414

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APPLICATION OF A MODEL OF ZOOPLANKTON COMPOSITION TO PROBLEMS OF FISH INTRODUCTIONS TO THE GREAT LAKES.
State Univ. of New York at Albany Dept of Biological Sciences
For primary bibliographic entry see Field 5C
W79-02020

ECOLOGICAL EFFECTS OF COOLING WATER OF A POWER PLANT AT KIEL FJORD,
Kiel Univ. (West Germany). Inst. fuer Meeresunde.
For primary bibliographic entry see Field 5C.
W79-02461

10. SCIENTIFIC AND TECHNICAL INFORMATION

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GEOGRAPHIC VARIATIONS IN SALT MARSH MACROPHYTE PRODUCTIONS: A REVIEW,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 2H.
W79-02098

A REVIEW OF THE BIOLOGY, ECOLOGY, AND MANAGEMENT OF SCIRPUS OLNEYI,

VOLUME I: AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2I.
W79-02110

A BIBLIOGRAPHY OF MARYLAND'S TIDAL WETLANDS (MARSHES-SWAMPS),
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2L.
W79-02111

BARRIER ISLANDS OF THE ATLANTIC AND GULF COASTS OF THE UNITED STATES: AN ANNOTATED BIBLIOGRAPHY,
Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 2L.
W79-02113

CONSIDERATIONS IN CONDUCTING BIOASSAYS,
WAPORA, Inc., Charleston, IL. Bioassay Lab.
For primary bibliographic entry see Field 5A.
W79-02349

10D. Specialized Information Center Services

DIRECTORY OF MEMBER ORGANIZATIONS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, RReston, VA. Water Resources Div.
M. D. Edwards, and J. M. Nokes.
Open-file report 78-872, 1978. 34 p, append.

Descriptors: *Data storage and retrieval, *Water resources, *Hydrologic data, *National Water Data Exchange(NAWDEX), *Directories, Member organizations.

The National Water Data Exchange (NAWDEX) is a national confederation of water-oriented organizations working to improve access to water data. It consists of member organizations from all sectors of the water-data community. This Directory provides the names, addresses, and telephone numbers of all NAWDEX member organizations and their designated NAWDEX representatives. (Woodard-USGS)
W79-02123

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Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-02297--02302	6
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National Water Well Association, Water Well Construction Technology	W79-02168--02184	17
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

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A13	11.00	E13	28.00	T13	675.00
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A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
A17	13.00	E17	40.00	T17	900.00
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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 12, NUMBER 6
MARCH 15, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 6
MARCH 15, 1979

W79-02501--W79-03000

e Secretary of the U.S. Department of the Interior has de-rmined that the publication of the periodical is necessary in the nsaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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06 WATER RESOURCES PLANNING
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

MULTIMODE MODELING OF THE WATER MOLECULE,
Science Applications, Inc., La Jolla, CA.
D. Rogovin, T. Stephens, and W. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 397, Price codes: A05 in paper copy, A01 in microfiche. Report AFWL-TR-253, Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico, Aug 1977. 71 p, 5 fig, 22 tab, 11 ref. F29601-75-C-0132.

Descriptors: *Water vapor, *Molecular structure, *Mathematical models, *Model studies, Water, Water structure, Attenuation, Light, Physical properties, Chemical properties, Atmosphere, Rotation-vibration energy levels.

This report presented three approaches to multimode modeling water vapor. These are: (1) A correlated bender approach that treats fluctuations in the bend angle as well as correlations of the bending mode with the OH stretch mode. Only a single 'effective' nuclear coordinate is used. (2) A model that treats all three vibrational degrees of freedom, mode-mode coupling as well as molecular rotation. In addition, the effects of centrifugal distortion are included in a nonperturbative manner. (3) A phenomenological approach based on the concept of fitting the A, B, and C rotation matrices, both diagonal components, to the rotation-vibration energy levels. This approach, although phenomenological in nature, is predictive. (Sims-ISWS)
W79-02859

1B. Aqueous Solutions and Suspensions

OPTICAL CONSTANTS IN THE INFRARED FOR K2SO4, NH4H2PO4' AND H2SO4 IN WATER,
Missouri Univ.-Kansas City. Dept. of Physics.
For primary bibliographic entry see Field 2K.
W79-02879

2. WATER CYCLE

2A. General

LINEAR GROUND-WATER FLOW, FLOOD-WAVE RESPONSE PROGRAM FOR PROGRAMMABLE CALCULATORS,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02651

A RAINFALL-RUNOFF MODELING PROCEDURE FOR IMPROVING ESTIMATES OF T-YEAR (ANNUAL) FLOODS FOR SMALL DRAINAGE BASINS,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02652

WATER WETLANDS, AND WOOD STORKS IN SOUTHWEST FLORIDA,
Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 2H.
W79-02677

APPLICATION OF COMPUTER WAVEFORM MATCHING TO MONITORING OF HYDROLOGIC SYSTEM PARAMETERS,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 7C.
W79-02836

WATER BALANCE OF ASIA, (IN RUSSIAN),
Akademiya Nauk SSSR Moscow. Inst. Geografii.
G. M. Nikolaeva, and G. M. Chernogaeva.
Sovietskoye Radio, Moscow (USSR), 1977. 115 p, 22 fig, 15 tab, 186 ref, 1 append.

Descriptors: *Water balance, *Asia, Water resources, Hydrologic cycle, Precipitation(Atmospheric), Runoff, Surface runoff, Subsurface runoff, Groundwater, Groundwater movement, Evaporation, Rainfall, Snowfall, Rivers, Distribution patterns, Mapping, Hydrology, *USSR.

This monograph was one of the issues in the series of publications prepared at the department of Hydrology, Institute of Geography, Academy of Sciences of the USSR. The work was based on the differentiated method of studying water balance. Besides defining precipitation, river runoff, and evaporation, the method discovered the land phase of the hydrologic cycle. Water balance elements, such as precipitation, total runoff, underground runoff, surface runoff, evaporation, and total moistening of an area, were determined for 220 river basins on the territory of Asia outside the USSR and for 600 basins of the Asian part of the USSR. For hydrologically unstudied areas, water balance elements were estimated on the basis of a series of interpolation relations between precipitation, total river runoff, and total moistening of the area. These relations are zonal by their nature since they reflect the dependence of the water balance elements on the natural environment in which their formation occurs. One of the major results of the study was the compilation of generalized maps on the water balance elements. The maps made it possible to reveal regularities and peculiarities of water balance distribution over the area of Asia and to assess chief water sources involving countries hydrologically poorly studied. Asia is the part of the world where the whole variety of the physiogeographic conditions of earth manifests itself, from tundra in the far north to the equatorial forests of Indonesia. Water balance maps, compiled for each of the water balance elements, made it possible, with the help of planimetry, to estimate river and surface flood runoff and the most regulated groundwater runoff drained by rivers. Tables presented the results of the estimates.
W79-02866

CHARACTERISTICS AND FILTERING OF NOISE IN LINEAR HYDROLOGICAL SYSTEMS,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W79-02914

2B. Precipitation

ACCURACY OF CANADIAN SNOW GAGE MEASUREMENTS,
Atmospheric Environment Service, Downsview (Ontario).
B. E. Goodison.
Journal of Applied Meteorology, Vol. 17, No. 10, p 1542-1548, October 1978. 5 fig, 17 ref.

Descriptors: *Snowfall, *Measurement, *Precipitation gages, *Canada, Snow, Precipitation(Atmospheric), Rain gages, On-site investigations, Data collections, Regression analysis, Data processing, Winds, Snow cover, Melt water, Snow melt, Snow surveys, Meteorology.

A field investigation to assess the accuracy and comparability of precipitation gage measurements of snowfall in Canada was initiated in 1973. The MSC Nipher shielded snow gage (Canadian standard gage), the Universal (Belfort) precipitation gage, and the Fischer and Porter precipitation gage were tested at open and sheltered sites. Shielded and unshielded pairs of gages were compared at an open site. Gage catch was related to 'ground true' snowfall water equivalent as measured on snow boards in a sheltered site. Each gage tested had unique performance characteristics. Curves of gage catch to ground true as a function of wind speed were given. The catch ratio of the Universal gage is higher than the Fischer and Porter for similar shielding and environmental conditions. The MSC Nipher shielded gage exhibits a superior catch efficiency. At lower wind speeds, this gage can overcatch. For winds up to 5.5 m/s, the catch of the Nipher gage is within 10% of true. A mean correction of 0.15 mm for retention loss is required for this non-recording gage. Reasons for the efficiency of this gage were suggested. Users of gage measurements of snowfall water equivalent in Canada must consider the method of measurement before analyzing or correcting snowfall data. (Sims-ISWS)
W79-02681

WHAT THE DESIGN ENGINEER NEEDS FROM THE HYDROMETEOROLOGIST,
CH2M Hill, San Francisco, CA.
For primary bibliographic entry see Field 7C.
W79-02683

WEATHER MODIFICATION ACTIVITIES IN TEXAS, 1974-77.
Texas Dept. of Water Resources, Austin. Weather Modification and Technology Section.
For primary bibliographic entry see Field 3B.
W79-02699

CLIMATE: WET COASTAL ECOSYSTEMS,
Stuttgart Univ. (Germany F.R.). Botanisches Inst.
H. Walter.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 61-67. 7 fig, 14 ref.

Descriptors: Salt marshes, *Mangrove swamps, *Climates, Wetlands, Marshes, Coastal marshes, Marsh plants, Geographical regions, Ecological distribution, Temperature, Rainfall.

Climate is of significance both for azonal vegetation of salt marshes and mangrove swamps, species distribution on a large scale, and patterns on a small scale. Mangrove swamps occur only in the tropical region, approximately between 32 degree N and 38 degree S due to mangrove's sensitivity to frost. Temperature requirements of the various mangrove swamps are not the same; however, even in a continuously humid climate the number of species decreases with increased distance from the Equator. The lack of mangroves along sections of the west coasts of North American and Africa is related to low water temperatures of cold ocean currents which wash their shores. Rainfall conditions can affect zonation with the tidal region by its effect upon salinity. Salt marshes in the climate zones outside the tropics can locally show such a high concentration of salt in the soil that areas without vegetation can occur. Marshes also show an impoverishment of species with increasing latitude and decreasing temperature. Along the sea coasts from the entire tropics into the Artic and Antarctic salt marshes ane composed exclusively of herbaceous halophytes. Only in the areas without cold winter, but isolated cold snaps, do some partly liquifed shrubs occur. (See also W79-02762) (Steiner-Mass)
W79-02765

DEW-MONITORING NETWORK IN THE SOUTHEAST,
National Weather Service, Auburn, AL. Environmental Studies Service Center.
For primary bibliographic entry see Field 7B.
W79-02853

WATER BALANCE OF ASIA, (IN RUSSIAN),
Akademiya Nauk SSSR Moscow. Inst. Geografii.
For primary bibliographic entry see Field 2A.
W79-02866

Group 2B—Precipitation

PRINCIPAL COMPONENTS ANALYSIS OF GLACIER-CLIMATOLOGICAL DATA FOR SENTINEL GLACIER, BRITISH COLUMBIA,
Department of Fisheries and Environment, Ottawa (Ontaria). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W79-02927

NORMAL PRECIPITATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
R. Lee, S. Tajchman, D. G. Boyer, and E. W. Repa.
West Virginia Agriculture and Forestry, Vol. 7, No. 2, p 12-18, December 1977. 10 fig, 4 tab, 3 ref. OWRT A-023-WVA(4), 14-34-0001-6051.

Descriptors: *Precipitation(Atmospheric), *West Virginia, Climatology, Dry seasons, Isohyets, Rainfall, Rainfall disposition, Snowfall, Wet seasons.

West Virginia lies near the average path of west-to-east cyclonic migrations that produce extensive activity during the colder months. Because of the topography, the climatologic diversification is exceptional. 'Normal' monthly and annual precipitation are defined, for purposes of this report, as mean values for the 30-year priod, 1947-76. Extensive tables, graphs, and illustrations, show the characteristics of normal and extreme precipitation in the state. Normal annual precipitation at individual stations ranges from about 32 to about 67 inches. County means range from about 34 to more than 56 inches. Normal annual precipitation for the entire state (based on a 66-station average) is 43.3 inches, but a more realistic average is 44.8, and the true normal precipitation must be about 47 inches. Precipitation is mostly rain. Normal annual snowfall depths range from about 15 to more than 150 inches, a maximum of about 25 percent of the normal precipitation. (Dodson--West Virginia)
W79-02984

2C. Snow, Ice, and Frost

A BIOLOGIST LOOKS AT OIL IN THE SEA,
Dalhouse Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5G.
W79-02615

ACCURACY OF CANADIAN SNOW GAGE MEASUREMENTS,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2B.
W79-02681

EFFECT OF SUBZERO TEMPERATURE IN CONCRETE ON THE NATURE OF OPERATIONS OF HIGH CONCRETE DAMS,
For primary bibliographic entry see Field 8F.
W79-02690

CONCRETE PLACING TECHNIQUES USED DURING THE CONSTRUCTION OF THE KRASNOIARSK HYDROELECTRIC POWER PLANT,
For primary bibliographic entry see Field 8F.
W79-02691

COEFFICIENT OF LINEAR EXPANSION OF MASSIVE CONCRETE AT A NEGATIVE TEMPERATURE,
For primary bibliographic entry see Field 8F.
W79-02692

SPECIFIC FEATURES OF CONSTRUCTION OF THAWED SOIL DAMS IN SEVERE CLIMATE CONDITIONS,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
For primary bibliographic entry see Field 8D.
W79-02693

THERMAL REGIME OF EARTH-ROCK DAMS CONSTRUCTED IN THE FAR NORTH,
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidrotekhniki, Leningrad (USSR).
For primary bibliographic entry see Field 8D.
W79-02694

FUNDAMENTALS OF CONSTRUCTING FROZEN TYPE EARTH DAMS IN THE ARCTIC,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
For primary bibliographic entry see Field 8D.
W79-02695

EVALUATION OF STABILITY OF EARTH-FILL DAM BASED ON STRENGTH OF FROZEN ZONES OF ITS PROFILE,
For primary bibliographic entry see Field 8D.
W79-02696

CONSTRUCTING CONCRETE DAMS IN REGIONS WITH SUBZERO AVERAGE YEARLY TEMPERATURE,
For primary bibliographic entry see Field 8F.
W79-02697

STUDIES OF NONSTATIONARY TEMPERATURE REGIME OF FROZEN DAMS MADE OF LOCAL MATERIALS ON PERMAFROST FOUNDATIONS.
For primary bibliographic entry see Field 8D.
W79-02698

INVESTIGATION OF SLUMPING FAILURE IN AN EARTH DAM ABUTMENT AT KOTZEBUE, ALASKA,
Cold Regions Research and Engineering Lab., Fairbanks, AK. Alaskan Projects Office.
For primary bibliographic entry see Field 8D.
W79-02702

THE ROLE OF ICE AND SNOW IN LAKE HEAT BUDGETS,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2H.
W79-02844

A NEW METHOD FOR COLLECTING WATER SAMPLES FROM BENEATH THE ICE,
Queen's Univ., Kingston (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 7B.
W79-02845

PREFERRED CRYSTAL ORIENTATIONS IN THE FAST ICE ALONG THE MARGINS OF THE ARCTIC OCEAN,
Army Terrestrial Sciences Center, Hanover, NH.
W. F. Weeks, and A. J. Gow.
Journal of Geophysical Research, Vol. 83, No. C10, p 5105-5121, October 20, 1978. 15 fig, 2 tab, 62 ref.

Descriptors: *Sea ice, *Ice, *Arctic, *Coasts, *Arctic Ocean, On-site investigations, On-site data collections, Crystals, Crystal growth, Anisotropy, Ice cover, Cold regions, Islands, Oceans, Ice-water interfaces, Crystal orientations, Crystal alignments.

Field observations of the growth fabrics of the fast and near-fast ice along the coasts of the Beaufort and Chukchi seas showed that at depths of more than 60 cm below the upper ice surface the sea ice crystals show striking alignments within the horizontal plane. At one site, this alignment was well developed at a depth of 15 cm, and in all cases the degree of preferred orientation increased with depth. In general, the c axes of the crystals were aligned roughly E-W parallel to the coast. In the vicinity of islands, alignment roughly paralleled the outlines of the islands, and in narrow passes between islands the alignment paralleled the channel. These observations, as well as similar observations made in the Kara Sea, can be explained if it is assumed that the c axes of the crystals are aligned parallel to the 'long-term' current direction at the sea ice-seawater inteface. The alignments are believed to be the result of geometric selection among the growing crystals, the most favored orientation being that in which the current flows normal to the (0001) plates of ice that make up the dendritic ice/water interface characteristic of sea ice. It was hypothesized that current flow in this direction reduces the thickness of the solute boundary layer as well as the salinity in the liquid at the interface. This lowered salinity allows crystals in the favored orientation to extend farther into the melt than neighboring crystals with less favored orientations. In addition, the current tends to induce a continuous flux of supercooled seawater against the sides of the crystals that extend ahead of the interface. This favors their lateral growth. The aligned crystal aggregate that forms has the overall characteristics of a single crystal. The development of such crystal alignments results in pronounced anisotropy in the mechanical, thermal, and electrical properties of fast ice. It was suggested that such crystal orientations can be used as an aid in determining current patterns in perennially ice-covered areas such as the Canadian ARchipelago. (Sims-ISWS)
W79-02850

ANALYTICAL COMPUTATION OF THE THREE-DIMENSIONAL STEADY-STATE TEMPERATURE CONDITION OF A DAM,
For primary bibliographic entry see Field 8D.
W79-02856

DAM OF THE ANADYRSK THERMAL ELECTRIC POWER STATION,
For primary bibliographic entry see Field 8D.
W79-02862

DESIGNING CONCRETE DAMS FOR ESPECIALLY HARSH CLIMATIC CONDITIONS,
All-Union Designing, Surveying and Scientific Research Inst., Hydroproject, Leningrad (USSR)
For primary bibliographic entry see Field 8F.
W79-02864

AN INVESTIGATION OF ICE FORCES ON VERTICAL STRUCTURES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
K. Hirayama, J. Schwarz, and H-C. Wu
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 879, Price codes: A08 in paper copy, A01 in microfiche. IIHR Report No. 158, June 1974. 164 p, 46 fig, 13 tab, 57 ref, 1 append. GK-35918X, CRREL DA-ENG-27021-72-G36.

Descriptors: *Ice, *Ice loads, *Structures, *Laboratory tests, *Model studies, Strength, Compressive strength, Tensile strength, Shear strength, Sea ice, Ice cover, Piles(Foundations), Bearing piles, Offshore platforms, Bridges, Cold regions, Mathematical models, Mechanical properties, *USSR, Ice forces.

Ice forces are the principal concern in designing offshore structures such as drilling platforms, transloading points, or bridge piers in arctic regions. Although some results have been obtained by field measurements in recent years, there are still significant gaps in the knowledge of ice forces on structures. In order to fill some of these gaps, the Iowa Institute of Hydraulic Research has undertaken model studies on the investigation of ice forces on vertical piles. Model techniques for the study of icebreaking phenomena have been developed, and the similarity between the model indications and prototype conditions has been demonstrated. Tests on the relationships between ice forces (ice strength) and pile diameter, between ice

thickness and relative velocity (strain rate), and between ice and structure have been completed. The experimental results were explained satisfactorily by a theoretical approach, and the combination of these relationships led to a basic empirical formula for the calculation of the maximum penetration strength for a circular pile, which agrees with available field measurements and also in part with model investigations in Russia. The suggested formula was modified for application to different structural shapes and degree of contact between ice and structure as well as for application to the indentation case of pile-ice interaction. Further studies are necessary to investigate the effect of ice temperature, scale effects, and the influence of salinity on the ice forces on structures. (Sims-ISWS)
W79-02865

CRYOPEDOLOGICAL RESEARCH IN THE CONSTRUCTION OF DAMS UNDER SEVERE CLIMATIC CONDITIONS,
Kuybyshevskii Inzhenero-Stroitelnyi Inst. (USSR). Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 8D.
W79-02867

DAM DESIGN AND CONSTRUCTION IN THE USSR'S NORTH AND SIBERIA,
All-Union Designing, Surveying and Scientific Research Inst., Hydroproject, Leningrad (USSR).
For primary bibliographic entry see Field 8D.
W79-02868

RECOMMENDED PRACTICE FOR THE DESIGN AND CONSTRUCTION OF EARTH DAMS FOR INDUSTRIAL AND POTABLE WATER SUPPLY IN THE FAR NORTH AND PERMAFROST AREAS.
For primary bibliographic entry see Field 8D.
W79-02871

FATE AND EFFECTS OF CRUDE OIL SPILLED ON PERMAFROST TERRAIN. FIRST YEAR PROGRESS REPORT,
Army terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5B.
W79-02902

GLACIER SURVEYS IN ALBERTA - 1975,
Department of Fisheries and Environment, Ottawa (Ontario). Water Resources Directorate.
I. A. Reid, J. O. G. Charbonneau, and L. A. Warner.
Report Series No. 60, 1978, 17 p., 8 fig., 4 maps, 9 ref.

Descriptors: *Glaciers, *Surveys, *Maps, *Mapping, *Volumetric analysis, Water resources, Streamflow, *Canada, *Alberta, *Athabasca glacier, *Saskatchewan glacier, Triangulation stations.

Glaciers act as natural regulators, storing water in winter and releasing it in summer. To gain some understanding of this phenomenon and the contribution which glaciers make to streamflow, the predecessors of the Water Survey of Canada began glacier surveys in 1945. The earlier surveys offered some clue to the role of the glacier, but the data collected were not sufficient to provide the overall picture. Following adoption of photogrammetric survey techniques, however, the glacier surveys have evolved to the extent that it is now feasible to produce a series of maps from which the linear, areal, directional and volumetric changes can be determined. The surveys have revealed that the glaciers, in general, are becoming smaller in size; hence the regulating effect on streamflow is diminishing. (WATDOC)
W79-02925

PRINCIPAL COMPONENTS ANALYSIS OF GLACIER-CLIMATOLOGICAL DATA FOR SENTINEL GLACIER, BRITISH COLUMBIA,
Department of Fisheries and Environment, Ottawa (Ontario). Water Resources Branch.
S. Fogarasi, and O. Mokievsky-Zubok.
Scientific Series No. 95, 1978. 9 p, 2 fig, 10 ref, 9 tab.

Descriptors: *Climatology, Analysis, *Data collections, *Glaciers, *Correlation analysis, Variability, Weather, Runoff, *Canada, *Sentinel Glacier, *British Columbia, *Components loadings.

Multivariate analysis is being carried out on glacier-climatological data in two stages. This paper describes the first stage, which is an application of principal components technique to the available data. The multicollinear climatological variables are transformed into orthonormal principal components. The characteristics and the interpretation of these principal components are described. Data transformations and the ensuing results are explained. The transformed new variables, the component vectors, are interpreted in terms of weather types. Recommendations are given for the second stage of the analysis, which is an application of multiple regression on principal components aimed at the estimation of runoff. (WATDOC)
W79-02927

A MODEL OF STAND PHOTOSYNTHESIS FOR THE WET MEADOW TUNDRA AT BARROW, ALASKA,
San Diego State Univ., CA. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-02946

NUTRIENT LIMITATIONS TO PLANT PRODUCTION IN TWO TUNDRA COMMUNITIES,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02947

2D. Evaporation and Transpiration

IRRIGATION OF URBAN LAWNS,
Colorado State Univ., Ft. Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 3D.
W79-02832

ISOTOPE HYDROLOGY OF INLAND SABKHAS IN THE BARDAWIL AREA, SINAI,
Weizmann Inst. of Science, Rehovot (Israel). Dept. of Research.
For primary bibliographic entry see Field 2H.
W79-02841

RESISTANCES TO WATER TRANSPORT IN RICE PLANTS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
For primary bibliographic entry see Field 2I.
W79-02986

THE RECOVERY OF LEAF WATER POTENTIAL, TRANSPIRATION, AND PHOTOSYNTHESIS OF COTTON DURING IRRIGATION CYCLES,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
H. Bielorai, and P. A. M. Hopmans.
Agronomy Journal, Vol. 67, No. 5, p 629-632. September-October 1975. 6 fig, 1 tab, 11 ref.

Descriptors: *Moisture stress, *Transpiration, *Photosynthesis, *Cotton, Irrigation, Irrigation effects, Crop response, Crop production, Soil water, Soil moisture, *Leaf water potential.

The ability of a plant to recover from temporary and/or prolonged stress and the rate of recovery are of great importance in crop production. However, the information available on this subject is relatively scarce. A study was conducted to evalute the recovery of irrigated cotton following soil moisture stress of various durations through the measurements of soil moisture stresss using (1) the soil-moisture retention function, leaf water potential, by pressure bomb, and (2) leaf diffusion resistance by diffusive resistance porometer. Photosynthesis was measured by an infrared gas analyzer, and transpiration by weighing. Neither leaf resistance nor transpiration fully returned to pre-stress conditions after irrigation. Continued measurements of net photosynthesis also showed a delayed and only partial recovery from soil water stress.
W79-02990

2E. Streamflow and Runoff

THE DEVELOPMENT OF FLOOD-POTENTIAL INDEX MAPS FOR PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-02598

UNSTEADY STREAMFLOW SIMULATION USING A LINEAR IMPLICIT FINITE-DIFFERENCE MODEL,
Geological Survey, NSTL Station, MS. Water Resources Div.
L. F. Land.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 127, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-59, May 1978. 59 p, 1 fig, 7 ref.

Descriptors: *Unsteady flow, *Model studies, *Channel morphology, *Reach(Streams), *Simulation analysis, Flow rates, Streamflow, Roughness coefficient, Mannings equation, Hydraulic properties, Backwater, Computer models, *Finite-difference model.

A computer program for simulating one-dimensional subcritical, gradually varied, unsteady flow in a stream has been developed and documented. Given upstream and downstream boundary conditions and channel geometry data, roughness coefficients, stage, and discharge can be calculated anywhere within the reach as a function of time. The program uses a linear implicit finite-difference technique that discritizes the partial differential equations. Then it arranges the coefficients of the continuity and momentum equations into a pentadiagonal matrix for solution. Because it is a reasonable compromise between computational accuracy, speed and ease of use,the technique is one of the most commonly used. The upstream boundary condition is a depth hydrograph. However, options also allow the boundary condition to be discharge or water-surface elevation. The downstream boundary condition is a depth which may be constant, self-setting, or unsteady. The reach may be divided into uneven increments and the cross sections may be nonprismatic and may vary from one to the other. Tributary and lateral inflow may enter the reach. The digital model will simulate such common problems as (1) flood waves, (2) releases from dams, and (3) channels where storage is a consideration. It may also supply the needed flow information for mass-transport simulation. (Woodard-USGS)
W79-02644

METHODS FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
R. H. Roeske.
Arizona Department of Transportation Report, Phoenix, Report ADOT-RS-15-121, September 1978. 82 p, 9 fig, 5 tab, 14 ref. (Prepared in cooperation with Department of Transportation, Federal Highway Administration.) HPR-1-15(121), 73-10.

Descriptors: *Flood frequency, *Flood peak, *Estimating, *Regression analysis, *Regional analysis, Arizona, Peak discharge, Methodology, Equations, Evaluation, Ungaged sites, Basin characteristics.

Regression equations for estimating flood magnitudes at ungaged sites for recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years were developed for six flood-frequency regions in Arizona. The equations relate flood magnitudes to one or more of the following statistically independent variables: size of drainage area, mean basin elevation, and mean annual precipitation. The regression equations are based on annual peak-discharge data collected at 221 gaging stations having 10 or more years of record. Flood magnitudes for selected recurrence intervals were determined for each station from a log-Pearson Type III frquency distribution, and multiple-regression analyses were used to relate flood magnitudes to basin characteristics. The regression equations apply to streams that are not affected significantly by regulation, diversion, or urbanization. Flood magnitudes and frequencies for the main stem of the Little Colorado River from the Zuni River to the mouth and for the main stem of the Gila River can be estimated from graphs in which discharge is related to size of drainage area for the Little Colorado River and to miles upstream and downstream from Coolidge Dam for the Gila River. (Woodard-USGS)
W79-02649

A RAINFALL-RUNOFF MODELING PROCEDURE FOR IMPROVING ESTIMATES OF T-YEAR (ANNUAL) FLOODS FOR SMALL DRAINAGE BASINS,
Geological Survey, Lakewood, CO. Water Resources Div.
R. W. Lichty, and F. Liscum.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 187, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-7, August 1978. 44 p, 9 fig, 7 tab, 23 ref.

Descriptors: *Model studies, *Floods, *Small watersheds, *Rainfall-runoff relationships, Regional analysis, Mathematical models, Analytical techniques, Regression analysis.

Maps depicting the influence of a climatic factor, C, on the magnitude of synthetic T-year (annual) floods were prepared for a large portion of the eastern United States. The climatic factors were developed by regression analysis of flood data using a parametric rainfall-runoff model and long-term rainfall records. Map estimates of C values and calibrated values of rainfall-runoff model parameters were used as variables in a synthetic T-year flood relation to compute 'map-model' flood estimates for 98 small drainage basins in a six-state study area. Improved estimates of T-year floods were computed as a weighted average of the map-model estimate and an observed estimate, with the weights proportional to the relative accuracies of the two estimates. The accuracy of the map-model estimates was appraised by decomposing components of variance into average time-sampling error associated with the observed estimates and average map-model error. Map-model estimates have an accuracy, in terms of equivalent length of observed record, that ranges from 6 years for the 1.25-year flood up to 30 years for the 50- and 100-year flood. (Woodard-USGS)
W79-02652

SURFACE WATER RESOURCES OF NORTHWEST FLORIDA,
Johnson (Bernard), Inc., Houston, TX.
Z. Qureshi.
Water Resources Bulletin, Vol. 14, No. 3, p 710 718, June 1978. 2 fig, 2 tab, 8 ref.

Descriptors: *Surface waters, *Florida, *Precipitation, *Evapotranspiration, *Basins, *Water budgets, Drainage, Inflow, Outflow, Runoff, Gaging stations, Groundwater.

Of the 1,700 streams located in Florida, the northwest area contains approximately 1,000 streams and three of the five largest rivers, namely the Apalochicola, the Choctawhatchee and the Escambia. This 11,200 square-mile area contains 11 drainage basins and receives an average annual rainfall which ranges from 53 inches in the east to 67 inches in the west. Basin water yields range from a high of 3,376 cfs (2,180 mgd) to a low of 672 cfs (434 mgd). Individual basin outflows range from a high of 25,743 cfs (16,630 mgd) to a low of 844 cfs (545 mgd). Approximately 67 percent of the total northwest Florida basin outflows to the Gulf of Mexico, or 36,805 cfs (23,766 mgd), are received in the form of surface water inflows from Alabama and Georgia. In the absence of any interstate mechanism for water management between Alabama, Florida, and Georgia, the basin outflow estimates presented herein depend greatly on the upstream usage in the neighboring states. The establishment of a tri-state water management program could eliminate the uncertainty involved in predicting water availability in northwest Florida and insure sufficient quantities of flows in the streams. (Bell-Cornell)
W79-02727

APPLICATION OF COMPUTER WAVEFORM MATCHING TO MONITORING OF HYDROLOGIC SYSTEM PARAMETERS,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 7C.
W79-02836

2F. Groundwater

ANALYSIS OF GRAVITY DATA FROM THE PICACHO BASIN, PINAL COUNTY, ARIZONA,
Arizna Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 7C.
W79-02599

WATER WELLS AND SPRINGS IN PALO VERDE VALLEY, RIVERSIDE AND IMPERIAL COUNTIES, CALIFORNIA,
Geological Survey, Laguna Niguel, Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02647

GROUNDWATER IN THE NEWBERG AREA, NORTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
F. J. Frank, and C. A. Collins.
Oregon State Engineer Ground Water Report No. 27, 1978. 77 p, 9 fig, 2 plates, 6 tab, 18 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water level fluctuations, *Water quality, Groundwater availability, Water yield, Withdrawal, Groundwater recharge, Hydrogeology, Drillers logs, Oregon, *Northern Willamette Valley, *Newberg area.

The Newberg area in Oregon consists of a series of uplands bounded by narrow low-lying plains and valleys and is approximately 360 square miles in size. In the western part, many of the wells that tap older volcanic and marine sedimentary rocks produce insufficient volumes of water for most uses. With the exception of the Troutdale Formation, nonmarine sedimentary rocks generally are poorly permeable sand and silt or lack the necessary thickness to store large volumes of water. Yields of most wells tapping the Troutdale Formation range from 20 to 150 gallons per minute. The most important aquifer in the area is the Columbia River Basalt Group. Wells drilled into the basalt generally produce from 15 to 1,000 gallons per minute. In a small part of the east side of the Newberg area, water levels in some wells have declined about 1 foot per year. In most of the basalt outcrop area, water-level fluctuations are seasonal. Ground water from the Columbia River Basalt Group and the nonmarine sedimentary rocks is chemically suitable for domestic and most other uses. Some of the wells drilled into the marine sedimentary rocks produce water that is too mineralized for general use. (Woodard-USGS)
W79-02650

LINEAR GROUND-WATER FLOW, FLOOD-WAVE RESPONSE PROGRAM FOR PROGRAMMABLE CALCULATORS,
Geological Survey, Louisville, KY. Water Resources Div.
J. M. Kernodle.
Open-file report 78-356, July 1978. 48 p, 4 fig, 2 tab, 5 ref.

Descriptors: *Groundwater movement, *Flow, *Simulation analysis, Analytical techniques, Diffusivity, Surface-groundwater relationships, Model studies, Programming languages, Equations, Linear programming, *Programmable calculators.

Two programs are documented which solve a discretized analytical equation derived to determine head changes at a point in a one-dimensional ground-water flow system. The programs, written for programmable calculators, are in widely divergent but commonly encountered languages and serve to illustrate the adaptability of the linear model to use in situations where access to true computers is not possible or economical. The analytical method assumes a semi-infinite aquifer which is uniform in thickness and hydrologic characteristics, bounded on one side by an impermeable barrier and on the other parallel side by a fully penetrating stream in complete hydraulic connection with the aquifer. Ground-water heads may be calculated for points along a line which is perpendicular to the impermeable barrie and the fully penetrating stream. Head changes at the observation point are dependent on (1) the distance between that point and the impermeable barrier, (2) the distance between the line of stress (the stream) and the impermeable barrier, (3) aquifer diffusivity, (4) time, and (5) head changes along the line of stress. The primary application of the programs is to determine aquifer diffusivity by the flood-wave response technique. (Woodard-USGS)
W79-02651

PRELIMINARY APPRAISAL OF THE GEOHYDROLOGIC ASPECTS OF DRAINAGE WELLS, ORLANDO AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-02656

FEASIBILITY OF WATER-SUPPLY DEVELOPMENT FROM THE UNCONFINED AQUIFER IN CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-02662

NICOMEKL-SERPENTINE BASIN STUDY, BRITISH COLUMBIA,
Department of Fisheries and Environment, Vancouver (British Columbia). Water Resources Branch.
For primary bibliographic entry see Field 4B.
W79-02785

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT MODEL FOR THE ANALYSIS OF CONTAMINANT TRANSPORT IN VARIABLY SATURATED POROUS MEDIA. USER'S GUIDE,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W79-02838

UNCERTAINTIES OF KARSTIC WATER RESOURCES SYSTEMS.
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and L. Simpson.
In: Karst Hydrology and Water Resources, Proceedings of the U.S.-Yugoslavian Symposium, Dubronik June 2-7 1975. Water Resources Publications, p 793-814, June 1976, 4 fig, 3 tab, 20 ref. OWRT B-043-ARIZ(12), 14-31-0001-5056.

Descriptors: *Karst hydrology, Groundwater management, *Risks, *Bayes analysis, *Groundwater models.

Uncertainties in karst water resource systems are identified and analyzed from the viewpoint of decision making. A discrete system framework is used to establish a two-way classification of five system elements versus six types of uncertainties. Typical system elements are: rainfall (input), cavity size (state), rainfall discharge relationship (state transition function), benefit-cost (output), and loss curves (output function). The uncertainty types may be natural, model, sample, economic, technological, or strategic. The problem of design under uncertainty is illustrated by the control of a karst reservoir. The effects of natural, model, and economic uncertainty on the decision (pumpage or release out of the reservoir) are briefly illustrated. Then the finite state model (FSM) is used to ascertain how input uncertainty affects the output. Use of the same FSM model for state (cavity size) identification is cast in a Bayesian framework. A complete Bayesian analysis of input uncertainty is given, which leads to the evaluation of the value of perfect information and the worth of one more sample point. With the information provided on the effect of various uncertainties, it is possible to allocate resources optimally from the viewpoint of decreasing the overall uncertainty in the decision-making process.
W79-02883

WELL FIELD SITE SELECTION BASED ON GEOLOGIC CRITERIA THAT INFLUENCE GROUND WATER CIRCULATION IN THE VICINITY OF LARAMIE, WYOMING,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 4B.
W79-02912

DUG-WELLS, DUG-CUM-BORE WELLS, AND TUBEWELLS,
Central Groundwater Board, Nagpur (India).
For primary bibliographic entry see Field 4B.
W79-02994

2G. Water In Soils

EVALUATION OF THE MC-300A SOIL MOISTURE METER TO DETERMINE IN-PLACE MOISTURE CONTENT OF REFUSE AT LAND DISPOSAL SITES,
Environmental Protection Agency, Cincinnati, OH. Solid Waste Management Office.
For primary bibliographic entry see Field 5A.
W79-02503

ROOT GROWTH IN CORES FORMED FROM FRAGIPAN AND B2 HORIZONS OF HOBSON SOIL,
Missouri Univ.-Columbia. Dept. of Agronomy.
R. W. Blanchar, C. R. Edmonds, and J. M. Bradford.
Soil Science Society of America Journal, Vol 42, No. 3, p 437-440, May-June, 1978. 4 fig, 2 tab, 24 ref. OWRT A-087-MO(3), 14-34-0001-6026 and 7053.

Descriptors: Soil strength, Bulk density, Penetrometer, Root stimulation, *Root growth, *Fragipan, Soil horizons, *Hobson soil, *Root systems.

The effect of changes in acidity and bulk density of cores formed from B2 and fragipan horizons of a Hobson soil on probe penetration and pea root growth were evaluated. Increasing soil pH in the range of 4.2-6.5 had no measurable effect on probe resistance, but resulted in greater root length in both B2 and fragipan samples. Probe penetration resistance increased as bulk density was increased. The salty clay loam B2 horizon was more resistant to probe penetration than the sandy loam fragipan when compared at the same bulk density and moisture tension. Root length was more closely related to probe penetration resistance than to bulk density. Root growth in both B2 and fragipan soil decreased as probe resistance increased from 10 to 20 bars and essentially stopped in soil where probe penetration resistance exceeded 20 bars.
W79-02592

PREDICTION OF HYDRAULIC CONDUCTIVITY CHANGES USING SOIL CHARACTERISTICS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. G. Boyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 380, Price codes: A08 in paper copy, A01 in microfiche. M.S. Thesis, 1978. 143 p, 15 fig, 12 tab, 41 ref, 3 append. OWRT A-035-ARIZ(2), 14-34-0001-3803.

Descriptors: *Hydraulic conductivity, Permeameter, Soil sealants, *Arizona, *Soil analysis, Soil texture, Sodium adsorption ratios.

Permeameter experiments were performed on six Arizona soils using a solution of 12.5 meq/l and varied sodium concentrations. Hydraulic conductivities for five soils were reduced 60 to 95 percent for input solutions having maximum sodium adsorption ratios (SAR) of 25. Effective soil sealing occurred even though the soils were alkaline. Sealing sodium appears nearly irreversible at low solution concentrations and saturated conditions. The soil having the highest initial hydraulic conductivity recovered less than 20 percent of the original conductivity upon reapplication of a calcium solution. These results are useful when considering sealing small ponds by sodium applications. Hydraulic conductivity changes from increases in solution SAR were described mathematically using two empirically determined parameters that appear unique for each soil at a constant concentration. The parameters found for this study, plus those found from data of previous studies, were compared using multiple regression analysis to determine the most significant soil properties in predicting conductivity changes. Soil texture has the greatest influence on the parameters. An equation derived by combining data from eleven alkaline soils was selected as best for predicting hydraulic conductivities resulting from SAR changes. Predictions should be improved if additional soil data were available for analysis.
W79-02600

TRANSFORMATIONS OF ORGANIC PHOSPHORUS SUBSTRATES IN SOILS AS EVALUATED BY NAHCO3 EXTRACTION,
Agricultural Research Service, Fort Collins, CO.
For primary bibliographic entry see Field 2K.
W79-02674

EMPIRICAL EQUATIONS FOR SOME SOIL HYDRAULIC PROPERTIES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. B. Clapp, and G. M. Hornberger.
Water Resources Research, Vol. 14, No. 4, p 601-604, August 1978. 2 fig, 2 tab, 15 ref. OWRT A-058-VA(2).

Descriptors: *Hydraulic properties, *Soil water, *Infiltration, *Equations, Model studies, *Mathematical models, Soil moisture, Soil water movement, Soils, Soil texture, Soil properties, Hydraulic conductivity, Soil physics, Soil science, Empirical equations.

The soil moisture characteristic may be modeled as a power curve combined with a short parabolic section near saturation to represent gradual air entry. This two-part function-together with a power function relating soil moisture and hydraulic conductivity- was used to derive a formula for the wetting front suction required by the Green-Ampt equation. Representative parameters for the moisture characteristic, the wetting front suction, and the sorptivity, a parameter in the infiltration equation derived by Phillip, were computed by using the desorption data of Holtan, et al. Average values of the parameters, and associated standard deviations, were calculated for 11 soil textural classes. The results of this study indicated that the exponent of the moisture characteristic power curve can be predicted reasonably well from soil texture and that gradual air entry may have a considerable effect on a soil's wetting front suction. (Sims-ISWS)
W79-02679

REMOTE SENSING OF SURFACE SOIL MOISTURE,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W79-02682

SIMULATION OF NUTRIENT LOSS FROM SOILS DUE TO RAINFALL ACIDITY,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W79-02730

GROWTH, ABUNDANCE AND DISTRIBUTION OF LARVAL TABANIDS IN EXPERIMENTALLY FERTILIZED PLOTS ON A MASSACHUSETTS SALT MARSH,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 2L.
W79-02755

SOILS OF THE INTER-TIDAL MARSHES OF DIXIE COUNTY, FLORIDA,
Florida Agricultural and Mechanical univ., Tallahassee. Dept. of Soil Science.
C. L. Coultas.
Florida Scientist, Vol. 41, No. 2, p 82-90, Spring, 1978. 2 fig, 2 tab, 23 ref.

Descriptors: *Soil types, *Tidal marshes, *Florida, Marshes, Wetlands, Soils, Clays, Organic matter, Erosion, Storms, Sulfur, Hydrogen ion concentration, Cation exchange, Dixie County(Fla).

Tidal marsh soils are diverse and have been subjected to considerable mixing. The soils are wet, near neutral in pH and have organic matter and clays concentrated at the surface resulting in high cation exchange capacities. Limestone occurs within 0.5-2.0 m of the soil surface. Psammaquents occur in lower marsh and Haplaquods in the upper marsh sites. Sulfaquents were found at the mouth of the Suwannee River. (Stihler-Mass)
W79-02757

SOILS OF MARINE MARSHES,
Scripps Institution of Oceanography, La Jolla, CA.
F. B. Phleger.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 69-77. 5 fig, 1 tab, 38 ref.

Descriptors: *Salt marshes, *Soil formation, *Sedimentation, Wetlands, Marshes, Coastal marshes, Muck soils, Soil microorganisms, Sedimentation rates, Tides.

The mineral composition of sediment varies upon the composition of the source materials availale in the drainage basin or in the adjacent open ocean. Organism contribute significant amounts of material in the form of plant debris and calcareous shell material. Marshes accumulate the finest sediment available in the system due to the low current velocities in the very shallow water. The finest sediments are deposited at the end of the tidal excursions where there is slack water or at the shallow edge of the estuary where dead water occurs. Marsh soils may have alternating laminae of coarse and fine sediment in certain locations. But most sediments are considerably reworked and otherwise modified by the roots of marsh plants and certain animals. Biogenic reworking can concentrate sand and product fecal pellets from organisms which ingest sediments to extract food. The pH of the soil surface water varies, depending on the time of day, and also upon the stage of the tide

in lagoonal marshes where there is marked tidal influence. Relative rates of deposition of sediment are indicated by the percent of the total foraminiferal, a type of shelled microorganism, population which is alive at the time of collection. (See also W79-02762) (Steiner-Mass)
W79-02766

CHEMICAL CHARACTERISTICS OF A FEEDLOT SOIL PROFILE,
Agricultural Research Service, Lincoln, NE.
For primary bibliographic entry see Field 5B.
W79-02783

USE OF NEUTRON ACTIVATABLE TRACERS FOR SIMULATING WATER AND CHEMICAL FLOW THROUGH POROUS MEDIA,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5B.
W79-02814

SOIL MORPHOLOGIC AND HYDRAULIC CHANGES ASSOCIATED WITH WASTEWATER IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G
W79-02817

DEVELOPING PROCEDURES FOR PREDICTING EFFECTIVENESS IN SEEPAGE CONTROL,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 4A.
W79-02820

INTERACTION BETWEEN LANDFILL LEACHATES AND CARBONATE-DERIVED RESIDUAL SOILS,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-02829

SOIL AND WATER LOSS FROM CONSERVATION TILLAGE SYSTEMS,
Science and Education Administration, Ames, IA. North Central Region.
For primary bibliographic entry see Field 3F.
W79-02852

ADSORPTION, MOBILITY AND DEGRADATION OF CYANAZINE AND DIURON IN SOILS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W79-02909

ATRAZINE PERSISTENCE IN A VALENTINE LOAMY FINE SAND PROFILE,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W79-02910

RELATIONS BETWEEN SOIL NUTRIENTS AND VEGETATION IN WETHEATHS. II. NUTRIENT UPTAKE BY THE MAJOR SPECIES IN THE FIELD AND IN CONTROLLED CONDITIONS,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-02939

THE PRODUCTIVITY OF A RANGE OF BLANKET BOG VEGETATION TYPES IN THE NORTHERN PENNINES,
Nature Conservancy, Alston (England).
For primary bibliographic entry see Field 2I.
W79-02945

NUTRIENT LIMITATIONS TO PLANT PRODUCTION IN TWO TUNDRA COMMUNITIES,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02947

FOSSIL PLANTS AND COAL: PATTERNS OF CHANGE IN PENNSYLVANIA COAL SWAMPS OF THE ILLINOIS BASIN,
Illinois Univ. at Urbana-Champaign. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-02955

2H. Lakes

CONCENTRATIONS OF TEN HEAVY METALS IN SOME SELECTED LAKE POWELL GAME FISHES,
New Mexico Univ., Alburguerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W79-02582

AGE, GROWTH, AND FOOD HABITS OF THE FATHEAD MINNOW, PIMEPHALES PROMELAS, IN NORTH DAKOTA SALINE LAKES,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. W. Held, and J. J. Peterka.
Transactions of the American Fisheries Society Vol. 103, No. 4, p 743-756, October, 1974. 2 fig, 7 tab, 31 ref. OWRT A-027-NDAK(2), 14-31-0001-3534.

Descriptors: *Minnows, Life history, Studies, Ecology, Bioassay, Salinity, Resistance, Potholes, Lakes, *Fish reproduction, Fish eggs, *Fish diets, *North Dakota, *Saline lakes.

Fathead minnows (Pimephales promelas Rafinesque) were abundant in 9 of 10 prairie pothole lakes in south-central North Dakota, selected to represent extremes in salinity. Fathead minnows were found in lakes with mean concentrations of total dissolved solids during ice-free periods ranging from 285 to 7,036 mg/liter; no fish were found in North Lake George with a mean concentration of 23,489 mg/liter total dissolved solids. Crustaceans were the most important food group by number, volume, and frequency of occurrence in 541 fathead minnow intestines collected from seven lakes during summer and fall 1969. Cladocerans were most important, followed by copepods and amphipods. Analysis of 30 brook sticklebacks (Culaea inconstans) from Wildlife Lake, 13 Iowa darters (Etheostoma exile) from Barnes Lake, and 5 tiger salamander larvae (Ambystoma tigrinum) from South Alkaline Lake indicated that Crustacea was the most important food group for these organisms. Fathead minnow fry appeared in early June and were seined (0.32-cm mesh) throughout the summer from 1 July to 1 September. The mean total length was 41 mm at the end of the first year of life and 58 mm at the end of the second. Only one fathead minnow from 2,100 aged had three annuli. Most fathead minnows in the lakes studied matured and spawned during their second summer and then died.
W79-02590

WATER WETLANDS, AND WOOD STORKS IN SOUTHWEST FLORIDA,
Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences.
J. A. Browder.
PhD Dissertation. August, 1976. 406 p.

Descriptors: *Wetlands, *Florida, *Water levels, *Wading birds, Water birds, Model studies, Simulation analysis, Computer models, Surface waters, Rainfall intensity.

Energy circuit models were used to study an oscillating ecosystem, the seasonally expanding and contracting wetlands of southwest Florida. Analog digital computers were used to simulate the effects of the natural rainfall pattern and of drainage on seasonal expansion and contraction of water area, production and concentration of fish, and feeding and reproduction of the Wood Stork (Mycteria americana). Regional-scale depth-area, area-volume, and depth-volume curves were developed to relate the intensity and timing of rain to the seasonally changing area of surface water. Classical hydrologic equations were combined with the regional curves to produce a water model simulating seasonal and long-term water storage and runoff. Patterns of land area covered by water from the water model were used to derive three models relating water patterns to fish and storks. Drainage and a downward trend is rainfall for the past 15 years have stressed the ecosystems causing a decline in wading birds. Simulations suggest that drainage more than decline in rainfall was responsible for the decrease in storks. Wood Storks have shown resiliency in adapting to the drained conditions, finding new feeding areas such as the marshes at Lake Okeechobee. (Steiner-Mass)
W79-02677

SATELLITE OBSERVATIONS OF CALCIUM CARBONATE PRECIPITATIONS IN THE GREAT LAKES,
National Environmental Satellite Service, Washington, DC
For primary bibliographic entry see Field 7B.
W79-02685

HABITAT AND SUCCESSIONAL CHANGES OF THE ATLANTIC COASTAL RIDGE OF PALM BEACH COUNTY, FLORIDA,
Florida Atlantic Univ., Boca Raton. Coll. of Science.
For primary bibliographic entry see Field 2I.
W79-02713

BIOLOGICAL PRODUCTIVITY IN TWO GEORGIA RIVER SWAMPS,
Tennessee Univ., Knoxville.
H E Boyd
PhD Dissertation, August, 1976. 98 p.

Descriptors: *Georgia, *Swamps, *Productivity, Wetlands, Oak trees, Nutrients, Mammals, Wildlife, Growth rates, Animal populations.

Data from coastal plain swamp sites showed correlations between the physiographic origins of two rivers, their load of dissolved and suspended matter, floodplain soil nutrient levels, height and diameter growth for the oak, Quercus laurifolia, and the standing crops and turnover of small mammal species. Soils of the Oconee River floodplain were statistically significantly higher in concentrations of Ca, Mg, NO3, and Na, and had a significantly high pH. The Canooche floodplain was significantly higher only in phosphate. Statistical tests comparing height on age and diameter on age for Laurel oaks showed significant differences between the two areas--both being faster in the Oconee floodplain. The oconee floodplain had higher densities of all small mammal species trapped. Only one species taken on the Oconee was not trapped on the Canoochee. Total cotton mouse biomass on the Oconee was as much as three times the biomass on the Canoochee when calculated from mean weights of each age category and the density for each period. The Oconee floodplain is believed to be more productive on the basis of greater cotton mouse biomass and turnover. (Steiner-Mass)
W79-02720

ECONOMIC INCENTIVES FOR INSTITUTIONAL CHANGE: THE CASE OF THE VIRGINIA WETLANDS ACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economies
For primary bibliographic entry see Field 6E
W79-02721

THE EFFECT OF SALINITY AND TIDAL INUNDATION ON PHOTOSYNTHESIS AND

PLANT WATER RELATIONS OF SPARTINA ALTENIFLORA LOISEL,
Duke Univ., Durham, NC. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02725

SPATIAL CHANGES IN WATERFOWL HABITAT,
Canadian Wildlife Service, Ottawa (Ontario).
G. D. Adams, and G. C. Gentle.
Occasional Paper Number 38, 29 p, 1978. 5 fig, 8 tab, 43 ref.

Descriptors: *Wetlands, *Wildlife habitat, *Waterfowl, *Spatial distribution, *Temporal distribution, Fresh water marshes, *Land use, Ducks(Wild), Aquatic habitat, Land classification, Distribution patterns, Vegetation.

The effects of land use on two waterfowl habitat types, waterfowl capability class 1 land (Block I) ad class 3 land (Block II), were assessed by documenting spatial changes in wetlands and vegetative cover occurring between 1964 and 1974. Block I showed a higher density and surface area in wetlands. On Block II, wetlands were more permanent, but cultivated land occupied proportionally more area. Both blocks showed net decreases in grassland and woodland areas, and net increases in wildlife areas. Wetland areas increased by 20% on Block I and 31% on Block II. Partial drainage influenced 15% of 424 wetlands on Block I, but 20% were altered by drainage and clearing, and 7% were lost during the decade. Open water marsh perimeter increased by 24% on Block I, but total wetland perimeters increased only slightly. Since only 53% of wetland perimeters were open on Block I in 1964, compared to 26% open on Block II, there was probably more intensive pothole clearing on Block I prior to 1964. Despite the net increase in wetland areas, the quantitative reduction in grassland cover on wetland margins has probably reduced potential duck nesting habitat. (Steiner-Mass)
W79-02742

APPLICATIONS OF REMOTELY SENSED DATA TO WETLAND STUDIES,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 7B.
W79-02749

HISTORICAL LAND USE CHANGES AND IMPACTS IN LAKE CHAMPLAIN WETLANDS (1941/42, 1962, 1974),
New England River Basins Commission, Burlington VT. Lake Champlain Basin Study.
For primary bibliographic entry see Field 4C.
W79-02750

DEVELOPMENTAL AND ENVIRONMENTAL HISTORY OF THE DISMAL SWAMP,
Indiana Univ. at Bloomington. Dept. of Botany.
D. R. Whitehead.
Ecological Monographs, Vol. 42, No. 3, p 301-315, 1972. 9 fig, 39 ref.

Descriptors: *Swamps, *Pollen, *Distribution patterns, *History, *Trees, *Virginia, Wetlands, Peat, Sediments, Geologic time, Vegetation, Dismal Swamp(Va NC), North Carolina.

Pollen analysis has indicated that the swamp is a relatively young feature, having begun to develop along drainage lows as recently as the late-glacial. Formation of extensive freshwater marshes along streams appears to have been brought about by general water table changes controlled by the post-glacial rise of sea level. As the sea continued to rise, marsh development proceeded inland and fine-grained organic sediments began to accumulate. By 6,000 B.P. approximately 50% of Dismal Swamp area had been mantled by fine-grained peat deposits. From 6,000 to 3,500 B.P. peat accumulation continued, but at an appreciably lower rate. This corresponds both to the hypsithermal interval and to a distinct slackening in the rate of sea level rise. By 3,500 B.P. peat had mantled virtually all of the interfluves and islands within the swamp. The pollen diagrams suggest a gradual change from boreal spruce-pine forests during the full-glacial, to somewhat less boreal pine-spruce during the late-glacial, to hardwood forests containing many species characteristic of the present northern hardwoods forests during the latter portion of the late-glacial, to hardwood-dominated forests containing species now found in southeastern Virginia during the early post-glacial. (Steiner-Mass)
W79-02751

NESTING WADING BIRD POPULATIONS IN SOUTHERN FLORIDA,
Everglades National Park, Homestead, FL.
For primary bibliographic entry see Field 2I.
W79-02753

EFFECTS OF GRASS CARP INTRODUCTION ON MACROPHYTIC VEGETATION AND CHLOROPHYLL CONTENT OF PHYTOPLANKTON IN FOUR FLORIDA LAKES,
Florida State Game and Freshwater Fish Commission, Lake Wales.
R. D. Gasaway, and T. F. Drda.
Florida Scientist, Vol. 41, No. 2, p 101-109, Spring, 1978. 5 fig, 1 tab, 21 ref.

Descriptors: *Aquatic plants, *Fish, Effects, *Grass carp, Algae, Rooted aquatic plants, Ponds, Lakes, Wetlands, *Florida.

Effects of grass carp on macrophytes and phytoplankton were studied in two natural ponds, a natural lake and a borrow pit. Macrophytes were reduced in all study areas after grass carp introduction, and several native species were eliminated although they remained where protected from grass carp. Eleocharis acicularis in Suwannee Lake was reduced from 40.16% to 0.4% cover one year after introduction. Chlorophyll a, b, and c content increased although generic richness of phytoplankton declined after introduction. (Stihler-Mass)
W79-02758

SEICHE STRUCTURE AND VERTICAL MIXING BELOW THE EPILIMNION IN SMALL LAKES,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-02813

A PRELIMINARY INVESTIGATION OF THE PHOSPHORUS LOADING CHARACTERISTICS OF LAKE CARNEGIE, PRINCETON, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W79-02835

ISOTOPE HYDROLOGY OF INLAND SABKHAS IN THE BARDAWIL AREA, SINAI,
Weizmann Inst. of Science, Rehovot (Israel). Dept. of Research.
J. R. Gat, and Y. Levy.
Limnology and Oceanography, Vol. 23, No. 5, p 841-850, September 1978. 2 fig, 3 tab, 14 ref.

Descriptors: Hydrology, *Isotope studies, *Surface waters, *Arid lands, Salinity, Salts, Brines, Coasts, Lakes, Runoff, Drainage, Evaporation, Groundwater, Subsurface waters, On-site data collections, Mathematical models, Data processing, Limnology, *Sabkhas, *Bardawil area(Sinai), *Sinai.

The changes in stable isotope composition of inland sabkhas can throw light on the hydrologic mechanisms which operate in these systems. Inflow waters were found to be of meteoric origin. Immediately after local rain, water drains from surrounding sand dunes onto the top of the salt crust, dissolving it. Further inflow of waters keeps the sabkhas inundated for weeks, but the different sabkhas were found to be open to varying degrees to the inflow of groundwaters and to outflow of brines into bottom sediments. (Sims-ISWS)
W79-02841

WARM BOTTOM WATER IN LAKE MICHIGAN,
Florida State Univ., Tallahassee. Dept. of Oceanography.
G. Marmorino.
Limnology and Oceanography, Vol. 23, No. 5, p 1017-1020, September 1978. 2 fig, 12 ref.

Descriptors: *Water temperature, *Lake Michigan, *Surveys, Measurement, Temperature, Lakes, Sounding, Stratification, Hypolimnion, Sampling, On-site investigations, Water properties, Water quality, Inversions.

A temperature increase of about 0.02C was measured with a freely falling probe in the bottom 12 m at a 100-m station in Lake Michigan in September 1977. Meter-thick temperature inversions were observed higher in the water column. The origin of the warmer water is unknown. (Sims-ISWS)
W79-02843

THE ROLE OF ICE AND SNOW IN LAKE HEAT BUDGETS,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
W. P. Adams, and D. C. Lasenby.
Limnology and Oceanography, Vol. 23, No. 5, p 1025-1028, September 1978. 3 tab, 9 ref.

Descriptors: *Heat budget, *Lakes, *Mathematical models, *Model studies, Equations, Snow, Ice, Freezing, Melting, Heat balance, Heat flow, Latent heat, Temperatire. Water temperature, Limnology.

Methods of precisely calculating the latent heat terms for snow and ice in the winter energy budget of lakes were presented. The ice term is normally overestimated and the snow term underestimated by existing methods. (Sims-ISWS)
W79-02844

A NEW METHOD FOR COLLECTING WATER SAMPLES FROM BENEATH THE ICE,
Queen's Univ., Kingston (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 7B.
W79-02845

A CHEMICAL MODEL OF HEAVY METALS IN THE GREAT SALT LAKE,
Utah Agricultural Experiment Station, Logan.
For primary bibliographic entry see Field 5B.
W79-02913

CHEMICAL LIMNOLOGY OF GEORGIAN BAY, 1974,
Department of Fisheries and Environment, Burlington (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W79-02923

RIFTING IN THE OKAVANGO DELTA,
Columbia Univ., New York.
C. H. Scholz.
Natural History, Vol. 85, No. 2, p. 34-43, February, 1976.

Descriptors: *Freshwater marshes, *Deltas, *Wildlife, *Geomorphology, Impounded water, Marshes, Wetlands, *Rifting, Natural refuge, Kalahari Desert, Botswana, Africa.

Okavango Delta, a perched water impoundment in the East African rift system formed by geologic faulting, is a fresh water swamp covering 6,500 sq miles in the Kalahari Desert region of Botswana. The delta supports a variety of plant and animal species including papyrus, mopani, pike, hippopotamus, crocodile, antelope, and ibis. It is one of the few game areas of Africa that has remained virtually unaffected by man due to its endemic

populations of tsetse flies and mosquitos. The region acts as a natural refuge and watering ground for many species during the dry season. Current pressures on the region arise from increasing demands for water supplies and the need for cattle grazing land. (Howard-Mass)
W79-02934

ASSESSMENT OF THE PHYSICAL AND BIOLOGICAL CHARACTERISTICS OF THE MAJOR LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
G. K. Gruendling, and D. J. Bogucki.
Lake Champlain Basin Study, New England River Basins Commission, Burlington, Vermont, May, 1978. 36 p, 21 tab, 12 ref.

Descriptors: *Freshwater marshes, *Lakes, *Classification, Wetlands, Northeast U.S., Hydrology, Marsh plants, Distribution patterns, Soil types.

A synopsis is given of the various descriptive data presently available on the wetlands of Lake Champlain. The physical section of the report examines wetlands using the hydrologic location, wetland topography and configuration, geomorphic features and mode of origin, and surficial material as main criteria. Twelve Lake Champlain wetlands are classified as either bayhead, riverine, riverine/levee, deltaic, or lakeside areas. The biological section is divided into two major parts. Part I characterizes twelve major wetland areas that have been investigated over the past few years. These have had detailed vegetation maps constructed for each wetland utilizing color and color infrared aerial photography, field surveys, and ecological studies relating plant distribution with soil types, water depths, and other environmental parameters. Part II summarizes cover-type maps for the remaining wetlands that have been investigated. (Steiner-Mass)
W79-02937

THE RELATIONSHIP BETWEEN NET PRIMARY PRODUCTION AND ACCUMULATION FOR A PEATLAND IN SOUTHEASTERN MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-02938

RELATIONS BETWEEN SOIL NUTRIENTS AND VEGETATION IN WETHEATHS. II. NUTRIENT UPTAKE BY THE MAJOR SPECIES IN THE FIELD AND IN CONTROLLED CONDITIONS,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
K. Loach.
Journal of Ecology, Vol. 56, No. 1, p. 117-127, March, 1968. 8 tab, 16 ref.

Descriptors: *Vegetation, *Competition, *Soil properties, *Deficient elements, *Wetlands, Phosphorus, Nitrogen, Soil structure, Primary productivity, Saturated soils, Bogs, Heaths, England.

Growth of the major species in three sites (molinietum, central associes, and valley bog) was compared in the absence of interspecific competition. Performance in this experiment did not always reflect the relative abundances in the natural plant cover of these sites (apparently due to competition). All species suffered the greatest reduction in dry weight when grown in the valley bog site. The soils were acutely deficient in phosphorus. In the field the phosphorus deficiency in the bog site is probably further aggrelated by the effects of waterlogging on root growth and nutrient uptake. Response to both these nutrients. Poor structure of the soils may have limited growth and response to nutrient additions in these soils. Drainage considerably improved growth in the Molinietum and central associes sites; drainage of the valley bog site was insufficient to improve growth because of the large nutrient deficiencies of the soils. (Stihler-Mass)
W79-02939

NUTRIENT-PHYTOPLANKTON RELATIONSHIPS IN THE HOLLAND MARSH, ONTARIO,
Guelph Univ. (Ontario), Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02944

THE PHYSICAL ENVIRONMENT AND BOTTOM FAUNA OF A BOG LAKE,
Newcastle-upon-Tyne Univ. (England). Dept. of Botany.
A. J. McLachlan, and S. M. McLachlan.
Archiv Hydrobiologie, Vol. 76, No. 2, p. 198-217, October, 1975. 7 fig, 5 tab, 37 ref.

Descriptors: *Bogs, *Benthic fauna, *Distribution patterns, Wetlands, Peat, Aquatic animals, Aquatic microorganisms, Diptera, Lake soils.

Two of the major animal species inhabiting the mud of a bog lake show strong preferences for distinct areas of the bottom. This distribution is remarkable in view of the small size of the lake and the uniform water depth. The mud is composed entirely of peat, the only variation being in the size of the fragments in different parts of the lake. The two species--larvae of the midges Chironomus lugubris and Glyptotendipes paripes--are shown to be associated with sediments containing different proportions of fine particles. The association between substrate type and benthic animals is attributed to the relatively simple and stable nature of the ecosystem. (Steiner-Mass)
W79-02949

INFLUENCES OF SPRING WATER LEVELS ON AQUATIC AND RIPARIAN PLANT DISTRIBUTION IN UPPER RICHELIEU AND MISSISQUOI BAY AREAS,
Quebec Univ., Montreal. Dept. of Biological Sciences.
C. Hamel, and P. Bhereur.
Laboratory of Applied Botany, University of Quebec at Montreal, August, 1977. 55 p, 8 fig, 3 tab, 7 ref.

Descriptors: *Swamps, *Aquatic plants, *Water level fluctuations, Lakes, Wetlands, Distribution patterns, Water levels, Vegetation establishment, Reservoir management.

Water level variations in the Missisquoi Bay and Richelieu River regions of Lake Champlain has been related to the life cycles of the aquatic plants in the area. In spring, the annual and interim fluctuations are of considerable importance because of their effect on forest regeneration and pike spawning grounds. The water level mark has relatively little influence on the plant life cycles, particularly those of trees, which are affected to a much greater extent by the length of the flood period. It is improbable that a permanent lowering of the maximum water levels would have a large impact on swamp forests which are generally composed of species which are very resistant to prolonged flooding. The aquatic plants, which are favored by the absence of natural competitors over long flood periods, would normally disappear from these swamp zones during low water, giving way to shrubby and herbaceous terrestrial vegetation. The distribution of aquatic plants in summer depends to a great extent on the water level. With high water levels, many aquatic plants invade the forests and with low water levels these species will withdraw from the forests and invade the middle regions of rivers and bays. (Steiner-Mass)
W79-02950

BIOLOGICAL FOUNDATIONS OF FOREST DRAINAGE EFFICIENCY,
Akademiya Nauk SSSR, Moscow. Lab. of Forest Sciences.
For primary bibliographic entry see Field 2I.
W79-02951

WETLAND HABITAT EVALUATION, VANCOUVER LAKE, WASHINGTON,
Jones and Stokes Associates, Inc., Sacramento, CA.
K. Miller, and C. R. Hazel.
November, 1977. 54 p, 6 fig, 6 tab, 15 ref.

Descriptors: *Wildlife habitat, *Wetlands, *Marsh management, *Washington, Lakes, Fresh water marshes, Dredging, Spoil banks, Environmental effects, *Vancouver Lake(Wash).

This report identifies and describes wetland and lowland wildlife habitats surrounding Vancouver Lake and estimates the value of these habitats to the dominant faunal species. An attempt is made to rank habitat types in order of their value to wildlife. The impact of lake dredging and spoil disposal on wildlife habitats are compared and evaluated for each proposed disposal site. Alternative plans of spoil disposal designed to avoid or minimize adverse impacts on the most valuable wildlife habitats are suggested as mitigation measures. The impacts of these alternatives are compared to those of the proposed project. Mitigation measures in the form of like-kind or trade-off compensation are discussed. (Steiner-Mass)
W79-02952

REEDS CONTROL EUTROPHICATION OF BALATON LAKE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W79-02954

FOSSIL PLANTS AND COAL: PATTERNS OF CHANGE IN PENNSYLVANIA COAL SWAMPS OF THE ILLINOIS BASIN.
Illinois Univ. at Urbana-Champaign. Dept. of Botany.
T. L. Phillips, R. A. Peppers, M. J. Avcin, and P. F. Laughnan.
Science, Vol. 184, No. 4144, p 1367-1369, June 28, 1974. 1 fig, 15 ref.

Descriptors: *Swamps, *Peat, *Coals, *Palynology, Pollen, Sediments, Spores, Temporal distribution, Clubmoss, Tree ferns, Wetlands, Marshes, *Illinois Basin(Ill).

Plant materials in coal balls are direct evidence of swamp vegetation, and through correlation of isolated spores and pollen with parent plants, coal palynology provides an extensive record of plant distribution. Lycopods, ferns, pteriodosperms, cordaites, and sphenopsids are five major plant groups which lived in peat-forming swamps. Changes in coal-swamp floras and the botanical constituents of coal throughout Pennsylvanian time are the result of broad climatic shifts and local environmental factors. The most striking change is from a lycopod-dominated flora to one in which tree ferns were the major element. This change occurred at the Desmoinesian-Missourian (Westphalian-Stephanian) boundary and was probably multicontinental in scope. (Howard-Mass)
W79-02955

A PRELIMINARY CLASSIFICATION OF WETLAND PLANT COMMUNITIES IN NORTH-CENTRAL MINNESOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2I.
W79-02956

INVESTIGATION OF A NUTRIENT-GROWTH MODEL USING A CONTINUOUS CULTURE OF NATURAL PHYTOPLANKTON.
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology
For primary bibliographic entry see Field 5C
W79-02962

2I. Water In Plants

FLORISTIC ANALYSIS OF THE MISSOURI RIVER BOTTOMLAND FORESTS IN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Botany.
W. R. Keammerer, W. Johnson, and L. Burgess.
Canadian Field-Naturalist, Vol. 89, No. 1, p 5-19, 1975. 2 fig, 5 tab, 26 ref. Contribution No. 182 from the Eastern Deciduous Forest Biome, US-IBP, and Publication No. 628, Environmental Sciences Division, Oak Ridge National Laboratory. OWRT A-022-NDAK(3), 14-31-0001-3534.

Much of the forest vegetation along the upper Missouri River has been inundated and destroyed by a series of large reservoirs. In North Dakota, the remnant forests fall readily into two classes, those dominated by Populus deltoides Marsh., and the more mesic forest of Fraxinus pennsylvanica Marsh., Acer negundo L., Ulmus americana L., and Quercus macrocarpa Michx. The vascular flora of these forests is comprised of 220 species, representing 54 families and 152 genera. Seven families (Compositae, Gramineae, Cyperaceae, Leguminosae, Labiatae, Rosaceae, and Ranunculaceae), all large families abundant in north-temperate regions, account for over half the total flora. Analysis of the Raunkiaer life-form in the flora of the bottomland forests shows the composition to be predominantly hemicryptophytic (53.2%). Phanerophytes and cryptophytes make up about 17% each, therophytes 11%, and only 1% of the flora is chamaephytic. Geographically, 73.1% of the species are North American, including arctic, subarctic, sub-arctic-temperate. and temperate distributions. Another 8% are circumpolar, while 18.6% are of European or Eurasian derivation. Many of the latter are widespread and wellknown waifs, agricultural weeds, and other ruderal species. A complete checklist is given, including notes on local distribution and relative abundance.
W79-02588

ROOT GROWTH IN CORES FORMED FROM FRAGIPAN AND B2 HORIZONS OF HOBSON SOIL,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-02592

APPLICATION OF FIVE METHODS FOR MEASUREMENT OF WILDLIFE VAUE; LOWER SHEYENNE RIVER BASIN, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 386, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, Dec 1975, 133 p, 10 fig, 17 tab, 63 ref, 12 append. OWRT B-030-NDAK(3), 14-31-0001-5102.

Descriptors: *Wildlife habitats, River basins, Priorities, River basin development, Evaluation, Wildlife, *North Dakota, *Sheyenne River Basin(ND).

An attempt was made to (1) describe the wildlife community of the Lower Sheyenne River Basin (LSRB), and (2) determine the value of that wildlife community. An estimate of the species composition of wildlife was determined from the literature and personal communications with State Game and Fish Department personnel. To determine the value of this wildlife, five techniques were applied to the LSRB: (1) utility value, (2) expenditures, (3) the value of comparative private recreation, (4) wildlife land value, and (5) the priority evaluator technique, a photo choice game simulating the marketplace. Resulting values were (1) annual utility value of $95,000 ($.11 to $1.16 per acre), (2) annual expenditures vaue of $304,777 ($.36 to $4.18 per acre), (3) annual value of alternative private recreation of $832,000 ($.98 to $14.93 per acre), and (4) the land value technique revealed an annual per acre return for wildlife of up to $33. The priority evaluator technique did not yield a specific value but revealed that people were more willing to sacrifice other environmental variables before wildlife habitat.
W79-02605

THE GENETIC BASIS OF THE ECOLOGICAL AMPLITUDE OF SPARTINA PATENS ON THE OUTER BANKS OF NORTH CAROLINA,
Duke Univ., Durham, NC. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02669

ENVIRONMENTAL FACTORS LIMITING THE DISTRIBUTION OF FIVE PLANT SPECIES ON SALT MARSHES OF ISLAND BEACH, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02678

HABITAT AND SUCCESSIONAL CHANGES OF THE ATLANTIC COASTAL RIDGE OF PALM BEACH COUNTY, FLORIDA,
Florida Atlantic Univ., Boca Raton. Coll. of Science.
D. R. Richardson.
M.S. Thesis. December, 1976. 87 p.

Descriptors: *Florida, *Vegetation, *Succession, *Wetlands, Swamps, Freshwater marshes, Land use, Coastal plains, Marsh plants, Distribution patterns, Drainage effects.

Predrainage vegetational patterns of the Atlantic Coastal Ridge of Palm Beach County were mapped and a detailed analysis of vegetational changes regarding succession was made by selecting specific areas throughout the overall study region. These areas were described by documenting community changes with regard to species composition and community location. A checklist of the vascular flora was made for each selected area. Using the entire coastal strip vegetation maps and specific study sites, generalizations were made regarding plant succession in the major plant communities; Beach, Coastal Strand, Tropical Hammock, Low Hammock, Scrub, Pine Flatwoods, Wet and Dry Prairies, Mangroves, Swamp, and Freshwater Marshes. Pre- and post-drainage historical and hydrological information was correlated with a geological history in order to show how the physical and biological factors affect vegetation. (Steiner-Mass)
W79-02713

THE EFFECT OF SALINITY AND TIDAL INUNDATION ON PHOTOSYNTHESIS AND PLANT WATER RELATIONS OF SPARTINA ALTENIFLORA LOISEL,
Duke Univ., Durham, NC. Dept. of Botany.
D. J. Longstreth.
PhD Dissertation, 1976. 124 p.

Descriptors: *Salt marshes, *Marsh plants, *Salt tolerance, Wetlands, Tidal marshes, Coastal marshes, Grasses, Salinity, Plant growth, Productivity, Tides.

Plants grown under conditions of low daily irradiance showed a 50% decline in photosynthesis between 10 ppt and 30 ppt salinity. Plants grown at high daily irradiance showed relatively little effect of salinity on photosynthesis up to concentrations of 30 ppt. Analysis of resistance to the diffusion of CO2 showed that the differences in photosynthesis measured under high stress conditions were the result of an increase in both stomatal and internal resistance with the stomatal resistance being largest. Field measurements of diurnal patterns of leaf xylem pressure and photosynthesis indicate that timing of tides may be important in controlling daily photosynthetic patterns. As plants become exposed at low tide, water stress increases and photosynthesis apparently decreases even under conditions which would otherwise be optimal. Therefore, daily totals of carbon fixation may vary depending on the timing of the tide. Maximal totals of carbon fixation may occur on days when the timing of high tide would alleviate water stress the most. Root inundation also does not have a negative effect on photosynthesis and in fact inundation may have a positive effect on plant response by relieving water stress.
W79-02725

SPATIAL CHANGES IN WATERFOWL HABITAT,
Canadian Wildlife Service, Ottawa (Ontario).
For primary bibliographic entry see Field 2H.
W79-02742

STUDIES ON THE ECOLOGY OF A STREAMSIDE FOREST: COMPOSITION AND DISTRIBUTION OF VEGETATION BENEATH THE TREE CANOPY,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
D. T. Bell.
Bulletin of the Torrey Botanical Club, Vol. 101, No. 1, p 14-20, January-February, 1974. 2 fig, 1 tab, 13 ref.

Descriptors: *Forests, *Flood plains, *Ecological distribution, *Flood frequency, Wetlands, Habitats, Vegetation, Streams, Riparian plants, Flooding, *Illinois, Ecology.

Distributions of 64 understory species were examined in the streamside forest of Robert Allerton Park, Piatt County, Illinois. Understory vegetation was strongly influenced by the complex environmental gradient associated with a vertical distribution of flooding frequency. Lower portions of the gradient, inundated up to 20% of the time, harbor a hardy robust population of perennials. With increasing elevation, the number of species capable of surviving in the habitat increases. Mid-areas of the gradient do not harbor a unique plant association, but contain outliers from both the upper and lower portions. The light regime in the upper portions of the gradient further determines the partitioning of available habitat space. Unflooded areas experience a change in species dominance associated with the closing of the crown canopy in late spring. (Stihler-Mass)
W79-02752

NESTING WADING BIRD POPULATIONS IN SOUTHERN FLORIDA,
Everglades National Park, Homestead, FL.
J. A. Kushlan, and D. A. White.
Florida Scientist, Vol. 40, No. 1, p 65-72, Winter, 1977. 2 fig, 1 tab, 8 ref.

Descriptors: *Wading birds, *Florida, *Nests, *Surveys, Population, Birds, Wetlands, Wildlife, Animal populations, Seasonal, Waterbirds, Everglades, *Big Cypress Swamp(Fla).

A 1974-1975 survey located 41 colonies containing 129,800 wading birds including ibises, herons, and storks. The largest colony was a late summer-autumn nesting colony in the Okaloacooche Slough in the Big Cypress Swamp. Only 25,900 wading birds, about 20% of the southern Florida population, nested in Everglades National Park during 1975. This indicates a great reduction since the 1930's and strongly suggests that some aspects of the natural ecological processes are no longer functioning in the southern Everglades National Park. White Ibis and Cattle Egret were most abundant species; populations of Great Egrets, Little Blue Herons, Louisiana Herons and Snowy Egrets were lower than expected. Wading birds nested year round but individual species had more circumscribed nesting seasons. (Stihler-Mass)
W79-02753

NOTES ON THE FLORA OF THE CONGAREE RIVER FLOODPLAIN, RICHLAND COUNTY, SOUTH CAROLINA,
South Carolina Wildlife and Marine Resources Dept. Columbia. Div. of Natural Area Acquisition and Resource Planning.

L. L. Gaddy.
Castanea, Vol. 42, No. 2, p 103-106, June, 1977. 1 tab, 6 ref.

Descriptors: *Vegetation, *Flood plains, *South Carolina, *Congaree River(SC), Deciduous trees, Swamps, Wetlands, Size, Trees.

The flood plain harbors 26 State and 8 National record-sized trees. Trees up to 170 feet in height and 26 feet in circumference occur here. Although a complete floristic study of the area is yet to be done, five county records, three of which are rare in the Carolinas, have been found in the Beidler Track of the flood plain. (Stihler-Mass)
W79-02756

CATTLE, WILDLIFE, AND RIPARIAN HABITATS IN THE WESTERN DAKOTAS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
K. E. Severson, and C. E. Boldt.
In: Management and Use of Northern Plains Rangeland. Reg. Rangeland Symposium, February 27-28, 1978, Bismarck, North Dakota, p 90-103. 17 ref.

Descriptors: *Riparian plants, *Grazing, *Cattle, Effects, *Habitats, *Livestock, Wetlands, Trees, Shrubs, *Great Plains, North Dakota, South Dakota, Range management, Agriculture.

Three riparian habitat types occur in the Northern Great Plains: draws in the upper reaches of grassland drainages, cottonwood-dominated floodplains, and juniper stands. Deciduous riparian habitats receive heavy livestock use because they provide shade, stay green longer than surrounding upland areas, and because they often indicate a water source. The results of such concentrated use are sparse stands of low vigor. Damage is induced by soil compaction, herbage removal and the resultant increase in soil temperature and evaporation from the soil, and physical damage to trees and shrubs. Observations indicate that season-long summer grazing is most detrimental. Management techniques that could prevent damage to woody species include alternating summer and winter use and changing the location of fences, watering places and salt stations. Prescribed fire may be useful for opening up shrub tickets or triggering sprout reproduction. (Stihler-Mass)
W79-02760

PLANT BIOMASS AND NET PRIMARY PRODUCTION ALONG A FLOOD-FREQUENCY GRADIENT IN THE STREAMSIDE FOREST,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
F. L. Johnson, and D. T. Bell.
Castanea, Vol. 41, No. 2, p. 156-165, June, 1976. 4 tab, 20 ref.

Descriptors: *Biomass, *Primary productivity, *Flood plain, *Vegetation, Streams, Forests, Wetlands, Ecological distribution, Trees, *Illinois.

Biomass and net annual primary production were calculated for three flood-frequency zones in the streamside forest coenocline. Aboveground biomass estimates were 290.0 t/ha in the lower flood plain, 142.1 t/ha in the occasionally flooded transition zone, and 234.2 t/ha in the upland. Aboveground net primary production estimates were 12.5 t/ha/yr in the flood plain, 8.0 t/ha/yr in the transition zone, and 10.8 t/ha/yr in the upland. Data on the species distribution of biomass are presented. Biomass and primary production differences along the coenocline are considered to be the result of individual species responses to flooding, available water, disease, and timber cutting. (Stihler-Mass)
W79-02761

ECOSYSTEMS OF THE WORLD 1: WET COASTAL ECOSYSTEMS.
For primary bibliographic entry see Field 2L.
W79-02762

INTRODUCTION; WET COASTAL ECOSYSTEMS,
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02763

PHYSIOGRAPHY; WET COASTAL ECOSYSTEMS,
For primary bibliographic entry see Field 2L.
W79-02764

SALT-MARSH ANIMALS: DISTRIBUTIONS RELATED TO TIDAL FLOODING, SALINITY AND VEGETATION,
Delaware Univ., Newark. Coll. of Marine Studies; and Delaware Univ., Newark. Dept. of Biological Sciences.
F. C. Daiber.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 79-108. 7 fig, 10 tab, 114 ref.

Descriptors: *Salt marshes, *Wildlife habitats, *Aquatic animals, *Distribution patterns, Wetlands, Coastal marshes, Marsh plants, Salinity, Aquatic environment, Muskrats, Wildlife, Aquatic life, Mollusks, Birds, Shore birds, Crabs, Crustaceans, Invertebrates.

Few species have tolerance limits broad enough to accommodate the variable conditions of a salt marsh. As a general rule, more species can be found in those shallow water areas seldom exposed to the air and those terrestrial regions seldom inundated even by storm tides. Zonation within a marsh is largely determined by salinity gradients, degree of inundation, and character of the substrate. Salinity affects the distribution of a wide range of species including Foraminifera, fiddler crabs, fish eggs and larvae, marsh birds, and muskrat. It acts directly on the osmotic regulatory device of some organisms through immersion and on the drinking mechanisms on others. It also affects vegetative zonation which determines animal distributions through locations and kinds of food and the availability of nest and home sites. Sediment type and particle size of the substrate influences the distribution of most burrowing animals. The adaptive techniques used for survival varies greatly between the animal groups to be found in salt marshes. (See also W79-02762) (Steiner-Mass)
W79-02767

THE COASTAL SALT MARSHES OF WESTERN AND NORTHERN EUROPE: AN ECOLOGICAL AND PHYTOSOCIOLOGICAL APPROACH,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 2L.
W79-02768

MANGALS AND SALT MARSHES OF EASTERN UNITED STATES,
Georgia Univ., Brunswick. Marine Resource Extension Center.
For primary bibliographic entry see Field 2L.
W79-02769

PLANT AND ANIMAL COMMUNITIES OF PACIFIC NORTH AMERICAN SALT MARSHES,
California Univ., Santa Barbara. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W79-02770

TIDAL SALT-MARSH AND MANGAL FORMATIONS OF MIDDLE AND SOUTH AMERICA,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W79-02771

AFRICA A. WET FORMATIONS OF THE AFRICAN RED SEA COAST,
Mansoura Univ. (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02772

AFRICA B. THE REMAINDER OF AFRICA: WET COASTAL ECOSYSTEMS,
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02773

OUTLINES OF ECOLOGY, BOTANY AND FORESTRY OF THE MANGALS OF THE INDIAN SUBCONTINENT,
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de la Carte Internationale du Tapis Vegetal.
For primary bibliographic entry see Field 2L.
W79-02774

WET COASTAL FORMATIONS OF INDO-MALESIA AND PAPUA-NEW GUINEA,
Auckland Univ. (New Zealand), Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02775

MANGALS OF MICRONESIA, TAIWAN, JAPAN, THE PHILIPPINES AND OCEANIA,
Kyushu Univ., Fukuoka (Japan).
For primary bibliographic entry see Field 2L.
W79-02776

MANGAL AND COASTAL SALT-MARSH COMMUNITIES IN AUSTRALIA,
Queensland Univ., Brisbane (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02777

EXPLOITATION OF MANGAL,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 2L.
W79-02778

HUMAN USES OF SALT MARSHES,
Maryland Univ., College Park. Chesapeake Research Lab.
For primary bibliographic entry see Field 2L.
W79-02779

SALT MARSH PLANT GERATOLOGY,
Georgia Univ., Brunswick. Marine Extension Service.
M. A. Hardisky, and R. J. Reimold.
Science, Vol. 198, No. 4317, p 612-614, November 11, 1977. 1 fig, 1 tab, 6 ref.

Descriptors: *Salt marshes, *Aquatic plants, *Biomass, *Productivity, Biological communities, Plant growth, Wetlands, Marshes.

The seasonal and spatial contribution of individual culms to overall biomass and structure of several salt marsh plant communities can be quantified through measurements of height increments and number of leaves. The continual addition of plant tissue to the marsh system by individual culms indicates the independence of peak standing crop biomass from annual production. This effect was more pronounced in the southern latitudes where seasonal climatic changes are less abrupt in controlling plant growth and senescence. Residence time of leaves, continual culm mortality, and pulses of detritus export are species dependent and constitute the essential processes controlling primary production that ultimately dictates the value of each plant species to the ecosystem. (Howard-Mass)
W79-02932

THE SEED BANKS OF PRAIRIE GLACIAL MARSHES,

Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
A. G. Van der Valk, and C. B. Davis.
Canadian Journal of Botany, Vol. 54, No. 15, p. 1832-1838, August 1, 1976. 1 fig, 2 tab, 20 ref.

Descriptors: *Freshwater marshes, *Aquatic plants, *Seeds, Soil properties, Vegetation effects, Marshes, Wetlands.

Sorensen's indices comparing the composition of seed banks within and among prairie glacial marshes ranged in value from 2 to 68%. Seed banks from different zones of the same marsh were more similar, with an average Sorensen's similarity index value of 41%, than seed banks from the same zone in different marshes where the average index values ranged from 24 to 28%. Differences among seed banks from marsh to marsh are due to differences in the vegetative composition of the marshes and the nature of the substrate. Allelopathic interactions in substrate samples with high amounts of organic matter may have resulted in either the inhibition of seed germination or the death of seedlings of several species. All marsh species were shown to be capable of dispersing to all zones of the marsh. (Howard-Mass)
W79-02933

RIFTING IN THE OKAVANGO DELTA,
Columbia Univ., New York.
For primary bibliographic entry see Field 2H.
W79-02934

PLANT STANDING CROP AND PRODUCTIVITY RELATIONS IN A SCIRPUS-EQUISTUM WETLAND,
McGill Univ., Montreal (Quebec). Dept. of Biology.
A. N. D. Auclair, A. Bouchard, and J. Pajaczkowski.
Ecology, Vol. 57, No. 5, p. 941-952, Late Summer, 1976. 8 fig, 1 tab, 72 ref.

Descriptors: *Standing crops, *Primary productivity, *Rooted aquatic plants, *Marshes, Aquatic plants, Growth rates, Marsh plants, Soils, Nutrients, Nitrogen, Phosphorus, Potassium, Hydrogen ion concentrations, Seasonal, Litter, Decomposing organic matter, Wetlands.

Dry weight shoot biomass, species composition, structure (species density, diversity, height) and soil parameters were examined on 45 1-sq meter plots in an extensive marsh complex in southern Quebec, Canada. Dominant emergent species included Scirpus fluviatilis, Equisetum fluviatile, Scirpus validus, Phragmites communis, and Eleocharis palustris. Shoot net productivity averaged 6.10 g/sq m/day, and terminal standing crop was 845 g/sq m. Seasonal productivity showed a strong biomodal pattern with peaks occurring in late-July and mid-September. Two-thirds of annual litter production was lost by export. Complete decomposition of the remaining litter occurred within the next growing season. Soil K had the highest correlation with standing crop while soil N had the highest correlation with shoot net productivity. Soil P was negatively correlated with all production. While shoot density and standing drop followed trends in soil nutrients, they coincided more closely with soil anion (nitrogen, hydrogen) concentration. Shoot net productivity and standing correlated negatively with all measures of species diversity. (Stihler-Mass)
W79-02936

ASSESSMENT OF THE PHYSICAL AND BIOLOGICAL CHARACTERISTICS OF THE MAJOR LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
For primary bibliographic entry see Field 2H.
W79-02937

RELATIONS BETWEEN SOIL NUTRIENTS AND VEGETATION IN WETHEATHS. II. NUTRIENT UPTAKE BY THE MAJOR SPECIES IN THE FIELD AND IN CONTROLLED CONDITIONS,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-02939

PHOTOSYNTHETIC PROPERTIES AND ROOT CHILLING RESPONSES OF ALTITUDINAL ECOTYPES OF TYPHA LATIFOLIA L.,
Syracuse Univ., NY. Biological Research Labs.
S. J. McNaughton, R. S. Campbell, R. A. Freyer, J. E. Mylroie, and K. D. Rodland.
Ecology, Vol. 55, No. 1, p. 168-172, Winter, 1974. 3 fig, 6 tab, 25 ref.

Descriptors: *Cattails, *Ecotypes, *Altitude, Photosynthesis, Carbon dioxide, Temperature, Phosphorus, Roots, Ecology, Environmental gradient, Wetlands, Rooted aquatic plants.

Photosynthetic characteristics of two low-altitude and two high-altitude populations of the broad-leaved cattail (Typha latifolia L.) were compared. Light-saturation characteristics and light-saturated rates in normal air were identical. Although carbon dioxide saturation characteristics were similar, photosynthetic rates at high CO2 concentrations (> 350 ppm in air) were higher in high-altitude ecotypes. Carbon dioxide compensation concentrations of the populations were similar over a wide range of temperatures. The effects of root chilling on water and phosphorus uptake were also compared in a low-altitude and a high-altitude ecotype. Root chilling reduced leaf water content and phosphorus uptake more in the low-altitude ecotype. The photosynthetic differences between the ecotypes seem to have minor ecological significance, but reductions in water and nutrient uptake upon root chilling suggest strong natural selection in the high-altitude site for ability to function efficiently in cold soils. (Stihler-Mass)
W79-02940

THE PRODUCTIVITY OF A RANGE OF BLANKET BOG VEGETATION TYPES IN THE NORTHERN PENNINES,
Nature Conservancy, Alston (England).
G. I. Forrest, and R. H. Smith.
Journal of Ecology, Vol. 63, No. 1, p. 173-202, March, 1975. 9 fig, 13 tab, 16 ref, 1 append.

Descriptors: *Bogs, *Productivity, *Aquatic plants, Soil moisture, *Pennines, Wetlands, United Kingdom.

A two-fold variation in annual production of 481 to 868 g per sq m was determined between seven blanket bog sites representing a range of variation in floristic composition in the northern Pennines. The mean total annual net production for all seven sites was 659 + over - 53 g per sq m. Between-year variation was relatively small in comparison to that between sites. The sites with the highest production were those which had been recently burnt. For the remaining sites, assumed to be in a steady state situation, there was a trend of decreasing production with increasing wetness, reflecting decreasing contribution of Calluna and Eriophorum vaginatum only partly replaced by increased Sphagnum growth on the wetter sites. Mean production per growing season day for the four Calluneto-Eriophoretum sites was 1.98 g per m. The total production of the 1215 ha of blanket bog within the Moor House National Nature Reserve was estimated at 7,670,000 kg per year. (Howard-Mass)
W79-02945

A MODEL OF STAND PHOTOSYNTHESIS FOR THE WET MEADOW TUNDRA AT BARROW, ALASKA,
San Diego State Univ., CA. Dept. of Biology.
P. C. Miller, W. A. Stoner, and L. L. Tieszen.
Ecology, Vol. 57, No. 3, p. 411-430, Late Spring, 1976. 13 fig, 4 tab, 62 ref.

Descriptors: *Tundra, *Model studies, *Aquatic plants, Photosynthesis, Radiation, Air temperature, Soil temperature, Carbon dioxide, Humidity, Soil-water-plant relationships, Wetlands.

A model developed by the U.S. Tundra Biome, IBP, was used to simulate profiles of radiation, air temperature, humidity, plant water relations, and photosynthesis in the vascular plant canopy of the Wet Meadow Tundra. Of the incoming solar radiation, approximately 20% was reflected back and 32% to 53% absorbed by the canopy, increasing with leaf area index. Heat loss by convection was 5 to 10 times greater than loss due to evaporation. Total seasonal plant CO2 uptake ranged from 400 to 627 g per sq m of ground. Soil respiration was implied as a source of CO2. Photosynthesis increased with solar radiation, air and ground temperatures, and air vapor density and decreased with increasing infrared radiation and root resistance to water uptake. Net photosynthesis was higher at the top of the canopy. After subtracting leaf growth costs, total accumulated CO2 became positive late in the season and was highest at lower canopy levels. Photosynthesis seemed adjusted to maximize carbon gain under the most frequent conditions but not under all or extreme conditions.
W79-02946

NUTRIENT LIMITATIONS TO PLANT PRODUCTION IN TWO TUNDRA COMMUNITIES,
Alberta Univ., Edmonton. Dept. of Botany.
R. W. Haag.
Canadian Journal of Botany, Vol. 52, No. 1, p. 103-116, January, 1974. 2 fig, 10 tab, 65 ref.

Descriptors: *Tundra, *Productivity, *Nutrients, Phosphorus, Soil moisture, Soil temperature, Arctic, Lowland meadow, Wetlands.

Response to nitrogen fertilization in a lowland wet sedge meadow and an upland birch-willow-heath community, including increased protein content and dry weight productivity, indicates nitrogen supply limits production in both soils. Phosphorus supply does not limit production in the upland community, but dilution of the soil solution in the lowland meadow may decrease phosphorus available and cause this element to become limiting. Low soil temperature exerts an indirect limitation on plant production through reduction of the rates of organic matter decomposition and microbial nitrification, thus limiting the rate of nitrogen cycling. Available nitrogen can be taken up and metabolized despite low soil temperatures which, along with nitrogen availability, directly limit phosphorus metabolism. The importance of a low nutrient regime in the Arctic may be seen in the widespread occurrence of xenomorphic characters in many taxa, which require minimal mineral nutrition to best use their photosynthetic capacity. The low nutrient regime may partially explain the high proportion of perennial plants since these species can accumulate a nutrient pool over time from a deficient environment. (Howard-Mass)
W79-02947

STUDIES OF THE INVERTEBRATE FAUNA OF A WET SLACK IN A SAND DUNE SYSTEM,
For primary bibliographic entry see Field 2L.
W79-02948

INFLUENCES OF SPRING WATER LEVELS ON AQUATIC AND RIPARIAN PLANT DISTRIBUTION IN UPPER RICHELIEU AND MISSISQUOI BAY AREAS,
Quebec Univ., Montreal. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2H.
W79-02950

BIOLOGICAL FOUNDATIONS OF FOREST DRAINAGE EFFICIENCY,
Akademiya Nauk SSSR, Moscow. Lab. of Forest Sciences.
S. E. Vompersky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 902, Price codes: A17 in paper copy, A01 in microfiche.
Indian National Scientific Documentation Centre,

New Delhi, 1977. 380 p, 58 fig, 78 tab, 280 ref. Translated from Russian.

Descriptors: *Bogs, *Drainage effects, Wetlands, Peat, Drainage, Habitats, Trees, Succession.

The principles of stand growth on drained peat and bog soils are discussed and the ecological-biological causes of varying drainage efficiency determined. When correctly implemented, the efficiency of drainage of boggy forests depends on the physical and chemical properties of the peat soils. The most important indices which determine the utility of peat soils for purposes of forest reclamation are ash content, botanical composition, and bulk density of peat. The important factors contributing to the improved growth of stands on drained bogs are: (1) total elimination of summer inundations and necrosis of roots, normalization of metabolism of trees, (2) increase in concentration of nutrient reserves in the root-inhabited layer of the soil because of its increased bulk density, (3) creation of favorable water and gas regime as also oxidation of toxic compounds in the relatively deep soil layers which were consantly or partly inundated earlier, and (4) increase in the thickness of the root-inhabited layer and improvement in the distribution of roots along the soil profile. (Steiner-Mass)
W79-02951

WETLAND HABITAT EVALUATION, VANCOUVER LAKE, WASHINGTON,
Jones and Stokes Associates, Inc., Sacramento, CA.
For primary bibliographic entry see Field 2H.
W79-02952

A PRELIMINARY CLASSIFICATION OF WETLAND PLANT COMMUNITIES IN NORTH-CENTRAL MINNESOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
L. M. Cowardin, and D. H. Johnson.
For sale by the Superintendant of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Stock No. 2410-00358. Fish and Wildlife Service, Special Scientific Report-Wildlife No. 168, 1973. 33 p, 1 fig, 7 tab, 14 ref, 15 append.

Descriptors: *Wetlands, *Minnesota, *Classification, Freshwater marshes, Marsh plants, Distribution patterns, Wildlife habitat, Waterfowl.

A classification of wetland plant communities was developed for a study area in northcentral Minnesota in order to analyze data on waterfowl use of habitat that were gathered by radio telemetry. The classification employs features of several earlier classifications in addition to new classes for bogs and lakeshore communities. Brief descriptions are given for each community, and the important plant species are listed. Discriminant function analysis was used for 40 plant species. Seventy-five percent of the stands studied were classified correctly by this technique. Average probabilities of assignment to communities were calculated and helped to identify distinct and poorly defined communities as well as the relationship among communities. (Steiner-Mass)
W79-02956

PLANT COMPETITION FOR ATRAZINE,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W79-02985

RESISTANCES TO WATER TRANSPORT IN RICE PLANTS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
V. S. Tomar, and B. P. Ghidyal.
Agronomy Journal, Vol. 67, No. 2, p 269-272, March-April 1975. 3 fig, 1 tab, 12 ref.

Descriptors: *Rice, *Transpiration, Soil-water-plant relationships, Irrigation, Irrigation practices, Flooding, Cultivation, *Cultural practices.

Rice is grown either in continuously flooded 'lowland' soils or under rainfed conditions in 'upland' soils. The objective of the study was to determine whether there are differences in resistance to water transport between plants grown in flooded and nonflooded soils. This information may be useful in understanding the plant-water relations under two cultural practices. The resistance to water transport in the non-flooded plants was nearly twice as high as in the flooded plants. The gradient between leaf and soil water potential increased markedly when plants were exposed to high air saturation deficit, however, the transpiration rate remained almost constant. These studies indicate the existence and development of large resistances to water transport in rice plants. (Skogerboe-Colo St)
W79-02986

THE RECOVERY OF LEAF WATER POTENTIAL, TRANSPIRATION, AND PHOTOSYNTHESIS OF COTTON DURING IRRIGATION CYCLES,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2D.
W79-02990

RESPONSES OF BERMUDAGRASS TO SALINITY,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 3C.
W79-02993

2J. Erosion and Sedimentation

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION, COMPOSITION, AND TRANSPORT OF MICROBIAL BIOMASS AND SUSPENDED MATERIAL IN A SALT MARSH ECOSYSTEM,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5B.
W79-02673

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF NUTRIENTS, A RAINFALL SIMULATION STUDY,
Iowa Natural Resources Council, Des Moines.
For primary bibliographic entry see Field 4C.
W79-02680

A DEVICE TO COLLECT SUPERNATANT WATER FROM MEASUREMENT OF THE FLUX OF DISSOLVED COMPOUNDS ACROSS SEDIMENT SURFACES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.; and Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W79-02686

SUSPENDED SEDIMENT AND BED MATERIAL STUDIES ON THE LOWER MISSISSIPPI RIVER,
Army Engineer District, Vicksburg, MS. Potamology Section.
For primary bibliographic entry see Field 8B.
W79-02703

PHYSIOGRAPHY; WET COASTAL ECOSYSTEMS,
For primary bibliographic entry see Field 2L.
W79-02764

DISSOLUTION POTENTIAL OF SURFICIAL MANCOS SHALE AND ALLUVIUM,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5B.
W79-02827

SOIL AND WATER LOSS FROM CONSERVATION TILLAGE SYSTEMS,
Science and Education Administration, Ames, IA. North Central Region.
For primary bibliographic entry see Field 3F.
W79-02852

SILT SAMPLING STUDY, BONNEVILLE SPILLWAY DAM, BONNEVILLE, OREGON.
Army Engineer Div. North Pacific, Bonneville, OR.
For primary bibliographic entry see Field 8D.
W79-02861

AN INEXPENSIVE AND EASILY FABRICATED SAMPLER FOR COLECTING SEDIMENT CORES TO MEASURE EH POTENTIALS,
University of West Floida, pensacola. Faculty of Biology.
For primary bibliographic entry see Field 7B.
W79-02917

CONTRIBUTION OF CHRONIC PETROLEUM INPUTS TO NARRAGANSETT BAY AND RHODE ISLAND SOUND SEDIMENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W79-02942

HIGH-MAGNESIUM CALCITE OOIDS FROM THE GREAT BARRIER REEF,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 2L.
W79-02999

2K. Chemical Processes

AN OVERVIEW OF NUTRIENT CYCLING RESEARCH AT COWEETA HYDROLOGIC LABORATORY,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4D.
W79-02571

FOREST SERVICE STUDIES OF SOIL AND NUTRIENT LOSSES CAUSED BY ROADS, LOGGING, MECHANICAL SITE PREPARATION, AND PRESCRIBED BURNING IN THE SOUTHEAST,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W79-02572

SIMULATION OF POTENTIAL EFFECTS OF FOREST UTILIZATION ON THE NITROGEN CYCLE IN DIFFERENT SOUTHEASTERN ECOSYSTEMS,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4D.
W79-02573

NUTRIENT BUDGETS FOR UNDISTURBED AND MANIPULATED HARDWOOD FOREST ECOSYSTEMS IN THE MOUNTAINS OF NORTH CAROLINA,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab
For primary bibliographic entry see Field 4D.
W79-02574

INVESTIGATION OF ISOTHIOCYANATOPENTAAQUOCHROMIUM (III) AS A REAGENT FOR THE SEPARATION AND IDENTIFICATION OF NANOGRAM QUANTITIES OF MERCURY (I), MERCURY (II), AND METHYLMERCURY (II),
North Dakota Univ., Grand Forks. Dept of

Chemistry.
For primary bibliographic entry see Field 5A.
W79-02589

PREDICTION OF HYDRAULIC CONDUCTIVITY CHANGES USING SOIL CHARACTERISTICS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W79-02600

CATHODIC STRIPPING METHODS FOR THE DETERMINATION OF PHOSPHATE AND ARSENATE IN NATURAL WATERS,
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5A.
W79-02602

TRANSFORMATIONS OF ORGANIC PHOSPHORUS SUBSTRATES IN SOILS AS EVALUATED BY NAHCO3 EXTRACTION,
Agricultural Research Service, Fort Collins, CO.
R. A. Bowman, and C. V. Cole.
Soil Science, Vol. 125, No. 1, p 49-54, January, 1978. 1 fig, 4 tab, 20 ref.

Descriptors: Chemical analysis, Organic compounds, Sodium compounds, Inorganic compounds, *Phosphorus, *Phosphorus compounds, Soil chemistry, Incubation, *Sodium bicarbonate extraction.

The sodium-bicarbonate method of Olsen et al. (1954) was primarily designed to extract inorganic P (Pi) and to correlate this P-pool with plant response. This procedure was used to follow the transformations of organic P (PO) substrates in soil. Various commercial PO substrates were added to a sandy loam soil, and were extracted immediately and after 1 to 18 days of incubation at field capacity. Glycerophosphate and all 3' nucleotide components of RNA were completely mineralized and accounted for in the NaHCO3 solution after 3 days. While RNA degraded in 18 days, sodium inositol hexaphosphate (Na-phytate) was relatively unaffected during this time and unrecoverable in the NaHCO3 solution upon immediate extraction. Thus, the labile compounds, like RNA, its four 3' nucleotides, and glycerophosphates were recoverable in the 0.5M NaHCO3-extracting solution (pH 8.5) of Olsen et al., while the Na-phytate, a relatively resistant compound, was not. Native Po was only slightly affected, however. A relatively constant amount of native Po was extracted, irrespective of extraction periods lasting 0.5 to 6 h. (Skogerboe-Colorado State)
W79-02674

A DEVICE TO COLLECT SUPERNATANT WATER FROM MEASUREMENT OF THE FLUX OF DISSOLVED COMPOUNDS ACROSS SEDIMENT SURFACES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.; and Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W79-02686

TRACE METALS IN THE WATERS OF A PARTIALLY MIXED ESTUARY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, and P. A. Yeats.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 147-162, August 1978. 7 fig, 2 tab, 34 ref.

Descriptors: *Trace metals, *Estuaries, *Canada, *On-site data collections, Heavy metals, Turbidity, Water analysis, Chemical analysis, Iron, Manganese, Cobalt, Copper, Zinc, Salinity, Data collections, Suspended solids, Water quality, Mixing, Intertidal areas, Cadmium, Distribution, Spatial distribution, Dissolved solids, *St. Lawrence Estuary.

The distributions of the trace metals iron, manganese, cobalt, nickel, copper, zinc, and cadmium in the upper St. Lawrence estuary were determined. The most important influence upon the distribution and behavior of the metals, apart from the character of the mixing between fresh and saline source waters, is the distribution and transport of suspended particulate matter. The estuarine turbidity maximum, which contains suspended particles enriched in cobalt relative to particles within both marine and river source waters, modifies the distribution of metals in the estuary and influences the character of the mixed outflowing water of salinity up to 20 parts per thousand. The influence of the turbidity maximum, which appears to be formed by particle trapping and the periodic settling and resuspension of sedimentary material, however, is confined to the estuary. Although the incoming and outgoing fluxes of suspended particulates in water are balanced, significant proportions of the influxes of iron (12%), manganese (19%), copper (24%), cobalt (27%), and zinc (44%) are removed within the system. The losses of iron, manganese, and cobalt occur predominantly at the expense of their particulate fractions. Suspended matter leaving the estuary in mixed surface water is depleted in manganese and cobalt, suggesting that the losses of these metals within the estuary occur primarily through the removal of exchangeable metal from riverborne particles within the turbidity maximum. (Humphreys-ISWS)
W79-02687

SIMULATION OF NUTRIENT LOSS FROM SOILS DUE TO RAINFALL ACIDITY,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W79-02730

ANALYSIS AND CHARACTERIZATION OF TRACE ELEMENTS IN SHALE OIL PRODUCTS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-02822

DISSOLUTION POTENTIAL OF SURFICIAL MANCOS SHALE AND ALLUVIUM,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5B.
W79-02827

PH FLUCTUATION IN AN INTERTIDAL BEACH IN BERMUDA,
Innsbruck Univ. (Austria). Inst. fuer Zoophysiologie.
For primary bibliographic entry see Field 2L.
W79-02842

A RAPID AND PRECISE METHOD FOR DETERMINING SULFATE IN SEAWATER, ESTUARINE WATERS, AND SEDIMENT PORE WATER,
Woods Hole Oceanographic Institution, MA. Joint Program in Biological Oceanography.
R. W. Howarth.
Limnology and Oceanography, Vol. 23, No. 5, p 1066-1069, September 1978. 2 tab, 11 ref. NSF OCE74-17859, DEB76-83877.

Descriptors: *Sulfates, *Chemical analysis, *Sea water, *Pore water, Water chemistry, Sediments, Salt marshes, Estuaries, Salinity, Chemicals, Volumetric analysis, Analytical techniques, Chemistry.

Sulfate can be rapidly and accurately measured by means of an indirect titration. Barium sulfate is precipitated in acid EDTA solution, the precipitate filtered and dissolved in an excess of EDTA at high pH, and the excess EDTA titrated with MgC12. Interferences from chloride, iron, or phosphate are negligible. Sulfides may interfere, but there is a procedure to remove this interference. The method determines the sulfate concentration in 1.0 ml of seawater with a standard deviation consistently less than 0.5% of the mean determination of three replicates. (Sims-ISWS)
W79-02846

MICROFLUOROMETRIC METHOD TO MEASURE AMMONIUM IN NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, GA.
W. S. Gardner.
Limnology and Oceanography, Vol. 23, No. 5, p 1069-1072, September 1978. 4 fig, 12 ref. NSF OCE75-06423.

Descriptors: *Ammonia, *Water chemistry, *Chemical analysis, *Fluorometry, Analytical techniques, Chemical reactions, Sea water, Pore water, Fluorescence, Laboratory tests, Ions, Chemicals, Colorimetry, Chemistry.

Ammonium can be measured fluorometrically after a simple chromatographic separation from amino acids and reaction with o-phthalaldehyde. The method (less than 0.5-ml sample required) is sensitive down to 0.2 micrometer NH4(+) in seawater. Fluorescence is proportional to concentration over the range of 0-100 micrometer NH4(+), and analysis time is 6 min per sample. (Sims-ISWS)
W79-02847

DETERMINATION OF SUBMICROMOLAR CONCENTRATIONS OF AMMONIA IN NATURAL WATERS BY A STANDARD ADDITION METHOD USING A GAS-SENSING ELECTRODE,
Bigelow Lab. for Ocean Sciences, Boothbay Harbor, ME.
C. Garside, G. Hull, and S. Murray.
Limnology and Oceanography, Vol. 23, No. 5, p 1073-1076, September 1978. 2 fig, 10 ref. NOAA 04-7-022-4404.

Descriptors: *Ammonia, *Water chemistry, *Chemical analysis, Analytical techniques, Electrodes, Methodology, Chemicals, On-site investigations, Laboratory tests, Water pollution, Pollutants, Chemistry, Gas-sensing electrodes.

A standard addition technique using a gas-sensing electrode with a modified electrode filling solution provides a rapid and convenient method suitable for both field and laboratory measurement of ammonia. The method has a detection limit of 0.2 micro M of NH3, a precision of + or -0.1 micro M of NH3, and no measurable salt error. Calibration is stable for a period of days, and analytical rates of 15 samples per hour are possible. (Sims-ISWS)
W79-02848

SOLAR MIDDLE ULTRAVIOLET (UV-B) MEASUREMENT IN COASTAL WATERS RICH IN YELLOW SUBSTANCE,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
For primary bibliographic entry see Field 2L.
W79-02849

MULTIMODE MODELING OF THE WATER MOLECULE,
Science Applications, Inc., La Jolla, CA.
For primary bibliographic entry see Field 1A.
W79-02859

OPTICAL CONSTANTS IN THE INFRARED FOR K2SO4, NH4H2PO4' AND H2SO4 IN WATER,
Missouri Univ.-Kansas City. Dept. of Physics.
M. R. Querry, R. C. Waring, W. E. Holland, L. M. Earls, and M. D. Herrman.
Journal of the Optical Society of America, Vol. 64, No. 1, p 39-46, January 1974. 7 fig, 3 tab, 24 ref. OWRT A-030-MO(5), A-063-MO(2), 14-31-0001-3025, 3225 and 3825.

Descriptors: Infrared, Reflectance, Spectroscopy, Aqueous solutions, Potassium sulfate, Hydrogen sulfate.

Relative, specular reflectances of individual 0.5M aqueous solutions of K2SO4 and NH4H2PO4 and of 3M H2SO4 were measured in the 2-20 micrometer region of the infrared for polarized radiant flux having the electric field vector perpendicular to the plane of incidence. Distilled water was the reflectance standard. The angle of incidence was 70.03 deg + or - 0.23 deg. Kramers-Kronig analysis of the relative reflectance spectra provided phase difference spectra for the aqueous solutions and a tabulation of spectral values relative to air for the index of refraction and extinction coefficient. The strengths of selected infrared bands of the solutes were determined by integrating values for the molecular extinction coefficients over the spectral regions of the bands.
W79-02879

THE EFFECT OF ORGANIC CARBON ON THE CONCENTRATIONS OF IRON AND HYDROGEN SULFIDE IN GROUND WATER,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W79-02908

CHEMICAL LIMNOLOGY OF THE NORTH CHANNEL, 1974,
Department of Fisheries and Environment, Burlington (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W79-02921

HIGH-MAGNESIUM CALCITE OOIDS FROM THE GREAT BARRIER REEF,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 2L.
W79-02999

2L. Estuaries

A REPORT ON THE CONCENTRATION, DISTRIBUTION AND IMPACT OF CERTAIN TRACE METALS FROM SEWAGE TREATMENT PLANS ON THE CHESAPEAKE BAY,
Chesapeake Research Consortium, Inc., Annapolis, MD.
For primary bibliographic entry see Field 5B.
W79-02511

ENVIRONMENTAL ASSESSMENT - ALTERNATIVES OF GENERAL MANAGEMENT PLAN AND WILDERNESS STUDY FOR CAPE LOOKOUT NATIONAL SEASHORE, NORTH CAROLINA.
National Park Service, Denver, CO. Denver Service Center.
For primary bibliographic entry see Field 6G.
W79-02525

COASTAL ZONE MANAGEMENT APPROVAL REGULATIONS,
For primary bibliographic entry see Field 6E.
W79-02535

AN ASSESSMENT OF THE OCCURRENCE OF HUMAN VIRUSES IN LONG ISLAND AQUATIC SYSTEMS,
Brookhaven National Lab., Upton, NY.
For primary bibliographic entry see Field 5C.
W79-02584

ECOLOGICAL EFFECTS OF AN ARTIFICIAL ISLAND, RINCON ISLAND PUNTA GORDA, CALIFORNIA,
Dames and Moore, Los Angeles, CA.
For primary bibliographic entry see Field 6G.
W79-02614

CHEMICAL AND BIOLOGICAL SURVEY OF LIBERTY BAY, WASHINGTON,
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W79-02634

EFFECTS OF BOTTOM SEDIMENTS ON INFILRATION FROM THE MIAMI AND TRIBUTARY CANALS TO THE BISCAYNE AQUIFER, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02653

PRELIMINARY EVALUATION OF THE WATER-SUPPLY POTENTIAL OF THE SPRING-RIVER SYSTEM IN WEEKI WACHEE AREA AND THE LOWER WITHLACOOCHEE RIVER, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-02655

THE GENETIC BASIS OF THE ECOLOGICAL AMPLITUDE OF SPARTINA PATENS ON THE OUTER BANKS OF NORTH CAROLINA.
Duke Univ., Durham, NC. Dept. of Botany.
J. A. Silander, Jr.
PhD Dissertation, 1976. 292 p.

Descriptors: *Marsh plants, *Genetics, *Physiological ecology, Wetlands, Salt marshes, Grasses, *North Carolina, Resistance, Salt tolerance.

Reciprocal and common garden transplantations of Spartina patens genets sampled along a transect of Codd's Creek, North Carolina, were employed in an analysis of evolutionary limits to species distributions. These studies revealed significant divergence among adjacent dune, swale, and marsh subpopulations for a variety of morphometric characters including number and size of fertile and vegetative culms, leaf size, flowering date, and seed production. Significant divergence among subpopulations was revealed in physiological traits. Dune genets were more salt and drought tolerant and elicited a better response to low nutrient conditions. Marsh genets were less salt and drought tolerant and responded better to high nutrients than other genets. Swale genets were intermediate Genetic variance in morphometric and physiological traits decreased slightly from marsh to dune. Gene flow was shown to be restricted among subpopulations as a result of differences in flowering time, selfing, and distance. Some migration was possible, particularly with respect to the swale subpopulation. Nonadaptive correlations were found among some characters under simultaneous selection in different subpopulations. These forces contribute simultaneously to a lower fitness of genets in the swale and dune subpopulations, thereby retarding evolution. (Steiner-Mass)
W79-02669

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION, COMPOSITION, AND TRANSPORT OF MICROBIAL BIOMASS AND SUSPENDED MATERIAL IN A SALT MARSH ECOSYSTEM,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5B.
W79-02673

ENVIRONMENTAL FACTORS LIMITING THE DISTRIBUTION OF FIVE PLANT SPECIES ON SALT MARSHES OF ISLAND BEACH, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Botany.
C. S. Rietsma.
PhD Dissertation, October 1976. 112 p.

Descriptors: *Salt marshes, *Marsh plants, *Ecological distribution, *Limiting factors, Wetlands, Tidal marshes, Coastal marshes, *New Jersey, Distribution patterns, Plant growth, Environmental effects, Environmental gradient, *Island Beach(NJ).

Six communities were distinguished by their respective dominant species: tall growth form of Spartina alterniflora, short growth form of S. alterniflora, Spartina patens, Distichlis spicata, Salicornia virginica, and Juncus gerardi. The level on the marsh at which each community was growing and the duration and depth of tidal flooding in each community was determined. Soil samples were collected during one growing season and determinations made of salinity; moisture content; organic matter content; water soluble chloride, sulfate, sodium, potassium, calcium, and magnesium; exchangeable sodium, potassium, calcium, and magnesium; cation exchange capacity; and acidity. Transplants of S. Patens, D. spicata, S. virginica, and J. gerardi did not survive well when moved into the tall and short S. alterniflora communities. Transplants of tall and short S. alterniflora grew poorly when moved into all communities occurring at higher elevations. Results of this research indicate that soil salinity and moisture may limit the five salt marsh species. S. patens, D. spicata, and J. gerardi may be limited by high salinities early in the growing season at low elevations in the marsh. (Steiner-Mass)
W79-02678

VOLATILE CHLORO- AND BROMOCARBONS IN COASTAL WATERS,
Maryland Univ., College Park, Dept. of Chemistry
For primary bibliographic entry see Field 5B.
W79-02684

TRACE METALS IN THE WATERS OF A PARTIALLY MIXED ESTUARY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2K.
W79-02687

A NOTE ON THE CIRCULATION INDUCED BY A SHALLOW-SEA FRONT,
Institute of Oceanographic Sciences, Birkenhead (England)
I. D. James
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 197-202, August 1978. 4 fig, 11 ref.

Descriptors: *Density currents, *Coasts, *Upwelling, *Mathematical models, Water circulation, Analytical techniques, Equations, Density stratification, Oceans, Model studies, Currents(Water), Stratified flow, Foreign research, *Celtic Sea, Eddy viscosity

The density current induced by a front which is a transition between well-mixed and stratified water was examined by means of a two-dimensional numerical model. It was shown that this may cause a convergence and upwelling near the front, which could have important biological consequences, together with a flow along the line of the front (Humphreys-ISWS)
W79-02688

SUSPENDED SEDIMENT AND BED MATERIAL STUDIES ON THE LOWER MISSISSIPPI RIVER.
Army Engineer District, Vicksburg, MS. Potamology Section.
For primary bibliographic entry see Field 8B.
W79-02703

HYDRAULICS AND DYNAMICS OF NEW CORPUS CHRISTI PASS, TEXAS: A CASE HISTORY, 1972-73.
Texas Univ. at Austin. Port Aransas Marine Science Inst.
For primary bibliographic entry see Field 8B.
W79-02707

SOLUTION OF COUPLED NONLINEAR ECOSYSTEM EQUATIONS,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
G. C. Niemeyer.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. EE5, p 849-861, October 1978. 5 fig, 12 ref.

Descriptors: *Water quality, *Estuaries, *Mathematical models, *Simulation analysis, *Ecosystems, Stability, Basins, Equations, Systems analysis, Finite elements, Finite differences, Nonlinearity, Physiography, Computation, Trophic level, *Kaneohe Bay(Oahu), *Hawaii.

An efficient procedure for solving an arbitrary number of coupled, nonlinear, vertically integrated transport equations can be achieved by exploiting unique features of both finite difference and finite element methods. A technique is derived that attains this end, and it is used in a preliminary simulation of a marine ecosystem. The technique is apparently independent of stability criteria, and as a result, the time-step can be determined by the time-scales of the physical and biological processes simulated or by the time-step of a compatible hydrodynamic model. The method does not require linearization of the governing equations, and the biological interaction terms therefore retain their inherent nonlinearity. The computational cost is determined primarily by the physiography of the basin, rather than by the number of component equations. Thus, relatively comprehensive ecosystems can be readily modeled. (Bell-Cornell)
W79-02714

ECONOMIC INCENTIVES FOR INSTITUTIONAL CHANGE: THE CASE OF THE VIRGINIA WETLANDS ACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economies.
For primary bibliographic entry see Field 6E.
W79-02721

AN ECOLOGICAL STUDY OF EPIPSAMMIC DIATOMS FROM SEDIMENTS ASSOCIATED WITH JUNCUS ROEMERIANUS IN A NORTHWEST FLORIDA SALT MARSH,
Florida State Univ., Tallahassee. Dept. of Biological Science.
T. L. Hart.
PhD Dissertation, June, 1977. 191 p.

Descriptors: *Salt marshes, *Florida, *Diatoms, Wetlands, Marshes, Sediments, Aquatic microorganisms, Chrysophyta, Organic compounds, Distribution patterns, Growth.

Epipsammic diatoms dominated the sand grain microflora within the maximum quantities of living diatom occurring at the sediment surface. From the surface the number of diatoms per sand grain decreased with depth until a minimum was reached at 5 cm. At this depth and below isolated pockets of diatoms did exist but were few in numbers. Variations in the quantities of living diatoms per sand grain and attached frustules were observed both in the horizontal and vertical planes. Natural communities of epipsammic diatoms induced with glucose took up the substrate at concentrations comparable to the affinity values obtained by laboratory cultures in uptake experiments. Isolated epipsammic diatoms incorporated a variety of organic compounds of heterotrophic growth. Among the 30 compounds tested, 15 were capable of supporting growth in one or more of the seven test diatoms. However, only glucose, lactate, and fructose supported heterotrophic growth in five or more test cultures. The majority of organic compounds were capable of supporting growth in only one or two species with no one species dominant. Eight nitrogen compounds were tested of which only ammonium chloride and gultamate provided nitrogen at an adequate level for growth in all seven species. (Steiner-Mass)
W79-02722

LINEAR PROGRAMMING MODEL TO QUANTIFY ECONOMIC, ENVIRONMENTAL AND SOCIAL VALUES OF A TIDAL MARSH,
Columbia Univ., New York. School of Engineering and Applied Science.
For primary bibliographic entry see Field 6B.
W79-02723

BIRD USE OF ANAHEIM BAY: A SOUTHERN CALIFORNIA SALT MARSH,
California State Univ., Long Beach, Dept. of Biology.
P. D. Romero.
M.S. Thesis, 1976. 174 p.

Descriptors: *Salt marshes, *California, *Birds, *Census, Wetlands, Coastal marshes, Wildlife habitat, Wildlife, Shore birds, Water birds, Rails, Migratory birds, Waterfowl, Animal populations.

A study made of Anaheim Bay, a coastal salt marsh, documented its utilization by resident and migratory birds. Some 123 species of birds were observed in the area. Eighty-three species were censused, and their use of habitats within the bay were analyzed. Anaheim Bay is an important wintering area for shorebirds, waterfowl, and other water-associated birds. Highest bird numbers occurred in late December and lowest in July. Use of habitats within the area was highly dependent on tidal conditions and less so on time of day and on weather conditions. Four endangered species--California Brown Pelican, California Least Tern, Light-footed Clapper Rail, and Belding's Savannah Sparrow--inhabit Anaheim Bay. Four species were found to breed within the marsh. (Steiner-Mass)
W79-02724

SALT MARSHES OF THE ALASKA PACIFIC COAST,
Rutgers - The State Univ., NJ. Dept. of Botany. Newark.
J. H. Crow.
In: Proceedings of the Symposium on Terrestrial and Aquatic Ecological Studies of the Northeast, Andrews, R. D. (ed.). Ecological Society of America and the Northwest Scientific Association, Eastern Washington State College, Cheney, p. 103-110, 1977. 1 fig, 1 tab, 12 ref.

Descriptors: *Salt marshes, *Alaska, Wetlands, Marsh plants, Distribution patterns.

From Juneau to Cook Inlet there are thousands of hectares of salt marshes where human disturbance is uncommon. A few of these marshes extend for more than 50 kilometers along the coastline while hundreds of small marshes cover only a few hectares. Very sharp boundaries exist between nearly all communities and are a characteristic feature of the marshes. Community and species diversity is often high; some communities having 20 or more flowering plant species in a square meter. The marshes are important to many kinds of animals and may serve as useful references in baseline studies. (Steiner-Mass)
W79-02743

THE SALT MARSH VEGETATION OF CHINA POOT BAY, ALASKA,
Rutgers - The State Univ., Newark, NJ. Dept. of Botany.
J. H. Crow, and J. D. Koppen.
In; Environmental Studies of Kachemak Bay and Lower Cook Inlet. Trasky, L., and Burbank, D. (eds.). Alaska Department of Fish and Game, Juneau, Alaska. Vol. II, p 716-744. 1977. 2 fig, 6 tab, 10 ref.

Descriptors: *Salt marshes, *Alaska, *Marsh plants, Wetlands, Distribution patterns, Grasses, Detritus, Marshes, Coastal marshes, Oil waters, *China Poot Bay(Alas).

Over 240 ha of salt marsh exists in China Poot Bay. The great majority of the marshland is covered by grass/succulent vegetation that is subject to frequent inundation by salty water or grows in habitats that accumulate salts. The dominance of Puccinellia hultenii-Comprises appears to distinguish the marshland from other marshes of comparable size that exist along the southcentral and southeastern regions of Alaska. Due to the nature of the vegetation and strong tidal influences, it is believed that oil spill damage in the vicinity of the bay presents a substantial hazard. Tidal removal of litter-detritus from the marsh appeared to be very high. Itj is hypothesized that this may be an important facet ot the highly productive marine ecosystem associated with China Poot Bay. (Steiner-Mass)
W79-02744

A CONCEPTUAL ECOLOGICAL MODEL FOR CHESAPEAKE BAY,
K. A. Green.
U.S. Fish and Wildlife Service, Biological Services Program. FWS/OBS-78/69. September, 1978. 22 p. 8 fig, 39 ref, 3 append.

Descriptors: *Model studies, *Chesapeake Bay, *Carbon cycle, *Cycling nutrients, Structural models, Wetlands, Wildlife, Vegetation, Waste disposal, Water quality.

A conceptual model for the Chesapeake Bay ecosystem (wetlands, tributaries, and bay proper) was developed as an interrelated series of diagrams showing carbon and nutrient pathways. Information was based on an analysis of local literature and discussions with scientists who are studying the Bay. The ecological functions that produce the resources of commercial and recreational fisheries, habitat for migratory birds and other wildlife, waste disposal, and aesthetic water quality are indicated. Physical (light, turbidity, mixing, transport, sedimentation) and chemical (sediment-water interactions, presence of pollutants) aspects of the environment modify the rates of biological processes (primary, production, nutrient regeneration, larval survival). A detailed ecosystem model combining the wetlands, plankton, seagrasses, other benthos, and fish trophic dynamics submodels shows the importance of material transfer and interactions between subsystems. (Steiner-Mass)
W79-02746

COASTAL WETLANDS: ROLE OF REMOTE SENSING,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 7B.
W79-02747

ENERGY FLUX IN A TIDAL CREEK DRAINING AN IRREGULARLY FLOODED JUNCUS MARSH,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
C. T. Hackney.
PhD Dissertation. May, 1977. 83 p.

Descriptors: *Tidal marshes, *Energy transfer, *Productivity, Wetlands, Salt marshes, Coastal marshes, Mississippi, Energy, Detritus.

The flux of suspended organic detritus, floating debris and animal biomass from a Mississippi tidal creek was studied during ten diurnal tidal periods (24 hour) and three semi-diurnal tidal periods (12 hour). There was a net export of floating debris (3.1 kg or 56,875 kj) and animals (0.49 kg or 9,721 kj), but a net import of suspended particulate detritus (38.5 kg or 209,540 kj) during the 13 tidal periods studied. The integration of these data is equal to an annual net import of six million kj or energy equivalent to less than 1% of the total productivity of the marsh. The energy equivalent of the floating detritus varied from 17.15 to 24.36 kj/gAFDW, while the energy equivalent of members of the marsh community varied from 20.32 to 30.49 kj/gAFDW. The concentration of suspended particulate organic detritus was predictable during ebb tide and was dependent primarily on tidal height, season, physical characteristics of the water (temperature, salinity, and dissolved oxygen) and the concentration of the fauna within the creek The concentration of particulate organic detritus

was not predictable during flood tide. (Steiner-Mass)
W79-02748

APPLICATIONS OF REMOTELY SENSED DATA TO WETLAND STUDIES,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 7B.
W79-02749

FACTORS AFFECTING TEMPERATURE AND SALINITY CONDITIONS ON A SCOTTISH SALT-MARSH, WITH NOTES ON THE ECOLOGY OF SPHAEROMA RUGICAUDA (LEACH),
Edinburgh Univ. (Scotland). Dept. of Zoology.
D. J. Heath.
Archiv fur Hydrobiologie, Vol. 75, No. 1, p 76-89, February, 1975. 3 fig, 3 tab, 18 ref.

Descriptors: *Salt marshes, *Salinity, *Water temperature, Wetlands, Estuaries, Marshes, Tidal marshes, Tides, Rainfall, Rivers, Mud, Ecological distribution, Salt tolerance, *Scotland.

Temperature and salinity determinations were made during spring tides over a period of 2.5 years on an estuarine salt-marsh in the Tyne estuary, East Lothian, Scotland. The range of temperature (-2.5 to 22.5 degrees C) and the range of salinity (0.7 to 34.1 ppt) were greater than the ranges reported for other estuaries. Estuarine water temperature showed a greater range than did river water, air, or sea water temperatures. Large expanses of mud in the estuary appear to influence the temperature of the estuarine water, raising it in the summer and lowering it in the winter. Salinity changed rapidly as the tide rose. Salinity at high water was negatively correlated to the flow of water in the river. Periods of heavy rainfall may result in low salinities. Findings are discussed in relation to the published works on the salinity and temperature tolerance of Sphaeroma rugicauda. (Stihler-Mass)
W79-02754

GROWTH, ABUNDANCE AND DISTRIBUTION OF LARVAL TABANIDS IN EXPERIMENTALLY FERTILIZED PLOTS ON A MASSACHUSETTS SALT MARSH,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
R. A. Meany, I. Valiela, and J. M. Teal.
Journal of Applied Ecology, Vol. 13, No. 2, p 323-332, August, 1976. 4 fig, 2 tab, 19 ref.

Descriptors: *Diptera, *Salt marshes, *Massachusetts, *Larvae, Insects, Fertilizers, Sludge, Ureas, Phosphorus, Effects, Life cycles, Foods, Growth rates, Ecological distribution, Wetlands, *Great Sippewissett Marsh(Mass).

Tabanus nigrovittatus and Chrysops fuliginosus, two of the four species of tabanid larvae found Great Sippewissett Marsh, comprised approximately 90% of the total tabanid population. They were both found predominantly in areas where the short form of Spartina alterniflora was the dominant plant. Larval tabanid populations were drastically reduced in plots treated with a sewage sludge fertilizer but were unaffected by treatments with a phosphate and a urea fertilizer. Larval densities were reduced in laboratory experiments from 80-240/ sq m to 40-120 sq through cannibalism. The lower figure approximates the densities found in the field. Summer growth rate is about 4 mm/month. (Stihler-Mass).
W79-02755

SOILS OF THE INTER-TIDAL MARSHES OF DIXIE COUNTY, FLORIDA,
Florida Agricultural and Mechanical univ., Tallahassee. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W79-02757

ECOSYSTEMS OF THE WORLD 1: WET COASTAL ECOSYSTEMS.
Elsevier Scientific Publishing Co., New York, 1977. 428 p. Edited by V. J. Chapman, University of Auckland, N. Z., Dept. of Botany.

Descriptors: *Wetlands, *Coastal marshes, *Mangrove swamps, *Geographical regions, *Distribution, Salt marshes, Temperate, Subtropical, Climates, Soils, Geomorphology.

Seventeen chapters by 18 authors review coastal wetlands, which comprise marine and brackish slat marshes of temperate regions and mangrove swamps in tropical and subtropical regions of the world. There is a preliminary consideration of the general nature of such wetlands followed by an account of the physiographic conditions under which they may and do develop. This is followed by a general account of the climatic conditions and soils associated with these wetlands, and the fauna to be found in them. Regional wetland sections are covered and the volume closes with an account of the uses to which these wetlands have been and are currently put to and the changes such uses involve. (See W79-02763 thru W79-02779) (Steiner-Mass)
W79-02762

INTRODUCTION; WET COASTAL ECOSYSTEMS,
Auckland Univ. (New Zealand). Dept. of Botany.
V. J. Chapman.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 1-29. 11 fig, 8 tab, 59 ref.

Descriptors: *Wetlands, *Coastal marshes, *Mangrove swamps, *Geographical regions, *Distribution patterns, Salt marshes, Distribution, Climates, Marsh plants, Temperature, Soil types, Silts.

The general distribution of mangrove swamps and salt marsh species/communities is broadly related to seven basic features of the maritime environment: air temperature, protected coastline, shallow shores, currents, slat water, tidal range, and substrate. The most extensive marshes and swamps are associated with regions where there is abundant silt brought down by rivers or where the geological nature of the land makes it subject to considerable erosion that results in much silt suspension. Salt marsh formations are essentially characterized by low-growing flowering herbs, especially grasses. Arising from the relatively small number of species and communities found on the marshes, broad geographical areas can be noted in which there is substantial uniformity in the vegetation. In some cases, subdivision can be based on temperature or upon soil types. Nine major groups of maritime salt marshes are reconizable with 13 subgroups. Mangrove swamp formations are wholly aborescent; however, at the northern and southern limits, the trees become shrubby. Segretation by temperature or soil types is not possible for the swamps--they are more closely related to past geographical spread. Six major groups of mangrove swamps with 11 subgroups are recognizable. (See also W79-02762) (Steinter-Mass)
W79-02763

PHYSIOGRAPHY; WET COASTAL ECOSYSTEMS,
J. A. Steers.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 31-60. 17 fig, 4 tab, 44 ref.

Descriptors: *Salt marshes, *Mangrove swamps, *Geomorphology, Wetlands, Coastal marshes, Tides, Sedimentation, Marsh plants, Channel morphology, Distribution patterns.

An account is given of salt marsh and mangrove swamp physiography, beginning with a discussion of salt marshes in England and Wales and then showing how marshes and mangrove areas in other geographical areas differ. In the early marsh stage, gowth is irregular, plants scattered, and sediments laid down by one tide may be removed by another. The tidal waters ebb and flow as a sheet and in time build up the the margins of the flat and the slightly higher parts of it. These areas increase in elevation and vegetation and begin to expand laterally so that tidal ebb and flow become restricted into vaguely delimited channels. With increasing marsh growth these become more defined and eventually become a creek system which is characteristic of a salt marsh. The factors of marsh development that must be considered for each geographic area are the tides, the type, ad means of sedimentation, the floor on which the sediments rest, the slope of this floor and the irregularities on it, and the type and spread of vegetation. (See also W79-02762) (Steiner-Mass)
W79-02764

CLIMATE: WET COASTAL ECOSYSTEMS,
Stuttgart Univ. (Germany F.R.). Botanisches Inst.
For primary bibliographic entry see Field 2B
W79-02765

SOILS OF MARINE MARSHES,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 2G
W79-02766

SALT-MARSH ANIMALS: DISTRIBUTIONS RELATED TO TIDAL FLOODING, SALINITY AND VEGETATION,
Delaware Univ., Newark. Coll. of Marine Studies; and Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I
W79-02767

THE COASTAL SALT MARSHES OF WESTERN AND NORTHERN EUROPE: AN ECOLOGICAL AND PHYTOSOCIOLOGICAL APPROACH,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
W. G. Beeftink.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 109-155. 14 fig, 10 tab, 222 ref.

Descriptors: *Coastal marshes, *Europe, Wetlands, Salt marshes, Distribution, Geographical regions, Distribution patterns, Ecological distribution.

An overall view is given of the biotic components of the West- and North-European salt marshes including the Atlantic coasts of the Iberian Peninsula. Attention is focused on the ecological features in pattern and process characteristic of salt marshes, and on their variability within this European coastal region. Remarks are given on the functional relationships within the European salt marsh ecosystem. The marshes are first considered as a border environment and their dominant diagnostics are briefly sketched. Among the organisms, phanerogams and their communities are first discussed, followed by remarks on algal and animal ecology. European salt marshes occupy a minor place in the total coast length. Generally the marshes show a disjunct distribution of limited areas, but on certain coasts they occupy vast parts of the shore. The marshes are found primarily in and around river mouths, but also in bays, Wadden areas, lagoons, and on beach plains protected by sand or shingle spits. (See als W79-02762) (Steiner-Mass)
W79-02768

MANGALS AND SALT MARSHES OF EASTERN UNITED STATES,
Georgia Univ., Brunswick. Marine Resource Extension Center.
R. J. Reimold.
In: Ecosystems of the World 1: Wet Coastal Ecosystems. Elsevier Scientific Publishing Co., New York, 1977, p. 157-166. 1 fig, 4 tab, 74 ref.

Descriptors: *Distribution, *Coastal marshes, *Atlantic Coastal Plain, Wetlands, Salt marshes, Geographical regions, Distribution patterns, Productiv-

ity, Marsh plants, Classification, Georgia, South Carolina.

Along the Atlantic coast of the United States there are some 890,308 ha of wetlands which include 589,480 ha of salt marshes. The distribution by state reveals that the greatest expanses occur along the central and southern reaches of the east coast. South Carolina and Georgia alone contain over 62% of all east coast salt marshes. The marshes have faunal and floral components common over this entire region. Spartina alterniflora, which dominates the intertidal zone, is the characteristic vegetation from eastern Canada to south Florida. It has the greatest productivity in Georgia, 2000-3000 g/aq m/year, and there appears to be a latitudinal variation in primary production. Since it is energy that originates in these primary producers that actually nourishes higher trophic levels in the salt marsh, future quantitative comparisons of salt marshes might best be based on production measurements using standardized techniques. The marshes of eastern North America may be classified as Spartina-Juncus marshes for world-comparative purposes. (See also W79-02762) (Steiner-Mass)
W79-02769

PLANT AND ANIMAL COMMUNITIES OF PACIFIC NORTH AMERICAN SALT MARSHES,
California Univ., Santa Barbara. Dept. of Geological Sciences.
K. B. MacDonald.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 167-191. 8 fig, 2 tab, 151 ref.

Descriptors: *Salt marshes, *Distribution patterns, *Halophytes, *Aquatic animals, *Pacific Coast Region, Wetlands, Marshes, Distribution, Coastal marshes, Marsh plants, Classification, Wildlife habitat, Wildlife, Salinity.

Both the general organization and the faunal composition of middle latitude Pacific salt marsh communities are closely similar to those described in other parts of the world. Shared genera are common and several examples of identical species can be cited. Only a few of the species appear to be restricted to this habitat. Instead, many marine macroinvertebrates represent estuarine genera commonly recorded for subtidal muds, rocky shores, or exposed open beaches. These species rarely penetrate the high marsh. Conversely, terrestrial species common in the high marsh rarely occur in the more frequently submerged low marsh. Among the more mobile salt marsh species, terrestrial forms appear to be both more numerous and diverse than mobile marine macroinvertebrates and fish. Amother taxa characteristic is the low species-diversity-high density population pattern widely regarded as typical of extreme, highly fluctuating physical environments. The vegetation of most of these marshes is dominated by a rather small number of halophytes often less than 10 and only rarely as many as 20 species per site. As salinities decline, as local freshwater sources appear, or as human disturbance increases, maritime, upland, or weedy species appear and the diversity of the marsh flora rapidly increases. (See also W79-02762) (Steiner-Mass)
W79-02770

TIDAL SALT-MARSH AND MANGAL FORMATIONS OF MIDDLE AND SOUTH AMERICA,
Louisiana State Univ., Baton Rouge.
R. C. West.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 193-213. 16 fig, 1 tab, 92 ref.

Descriptors: *Salt marshes, Mangrove swamps, *Atlantic Coastal Plain, *Pacific Coastal Plain, *Gulf Coastal Plain, *Distribution patterns, Wetlands, Tidal marshes, Coastal marshes, Marshes, Swamps, Distribution, Halophytes, Marsh plants, Ecological distribution, Gulf of Mexico, Louisiana, Sites.

Along the northern coast of the Gulf of Mexico, salt marshes are best developed on the fringes of the inactive Mississippi River delta and the coastal plain of Louisiana. More than three-fourths of the total salt marsh acreage along the Gulf Coast, and half of the total U.S. acreage, occurs there. In floristic composition and succession, they are closely related to those of the Atlantic coast with Spartina, Juncus, and Distichlis as dominants. The dominance of cliffed coasts, extensive sand beaches, and dume fields have limited tidal marshes along the Atlantic from southern Brazil to Tierra del Fuego to relatively small deltaic plains and river mouths. On the pacific side, marshes are confined to small disjunct inlets along the southern and central coast of Chile. South American species of Spartina, Distichlis, Juncus, and Salicornia dominate north of approximately 44 degrees S. South thereof, low salt tolerant shrubs become dominant as Spartina and other salt grasses rapidly decline in abundance. Tropical salt marsh formations are usually limited in extent because of competition with mangrove species. On the Atlantic, mangroves extend from the tip of Florida to southern Brazil. On the Pacific, they range from northwestern Mexico to the Peruvian-Ecuadorian border. (See also W79-02762) (Steiner-Mass)
W79-02771

AFRICA A. WET FORMATIONS OF THE AFRICAN RED SEA COAST,
Mansoura Univ. (Egypt). Dept. of Botany.
M. A. Zahran.
In:Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p 215-231. 6 fig, 1 tab, 49 ref.

Descriptors: *Salt marshes, *Mangrove swamps, *Red Sea, *Distribution patterns, *Sites, Wetlands, Coastal marshes, Marshes, Swamps, Halophytes, Marsh plants, Ecological distribution, Cattails, Classification.

The wet formations of the African Red Sea coast are comprised of mangrove swamps, reed swamps, and salt marshes. The mangrove vegetation, dominated by Avicennia marina, is well developed along the entire coast. The reed swamp vegetation, dominated by Phragmites australis and Typha domingensis, is distributed along the entire coast in limited patches where the soil is relatively less saline and the water not too shallow. The initial salt marsh vegetation comprises 23 principal community types. These may be ecologically classified into two main groups: communities of the saline flats and communities of the piled sand. the communities, even those which are ecologically and morphologically similar, are scattered in their geographical distribution. Vegetative zonation is complete only where the shore rises gently and gradually into the land, and this occurs rarely. The topography of the salt marsh comprises different types of shoreline bars, and its ground may be studded by mounds and hummocks of various dimensions. (See also W79-02762) (Steiner-Mass)
W79-02772

AFRICA B. THE REMAINDER OF AFRICA: WET COASTAL ECOSYSTEMS,
Auckland Univ. (New Zealand). Dept. of Botany.
V. J. Chapman.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p 233-240. 6 fig, 1 tab, 27 ref.

Descriptors: *Salt marshes, *Mangrove swamps, *Distribution patterns, *Sites, *African, Wetlands, Coastal marshes, Marshes, Swamps, Marsh plants, Halophytes, Ecological distribution.

The locations and major vegetative dominants are given of the salt marshes and mangrove swamps of the African coast. Along the North African coast Juncus acutus salt marsh communities frequently occur where there is high water moisture, salt and good drainage. Less saline areas on the landward side are occupied by Tamarix africana. Mangrove swamps predominate along West Africa with only a few isolated patches of salt marsh. Mangroves predominate along the East African coast, especially in the estuaries and along the offshore coral reefs. Temperatures along the South African coast are too cool for mangroves and the wet coastal formations are salt marshes. (See also W79-02762) (Steiner-Mass)
W79-02773

OUTLINES OF ECOLOGY, BOTANY AND FORESTRY OF THE MANGALS OF THE INDIAN SUBCONTINENT,
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de la Carte Internationale du Tapis Vegetal.
F. Blasco.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p 241-260. 4 fig, 2 tab, 70 ref.

Descriptors: *Mangrove swamps, *Distribution patterns, Wetlands, Ecological distribution, Sites, Deltas, Halophytes, Vegetation regrowth, Marsh management.

In the Indian territory, the mangrove swamps cover over 350,000 ha. Of this wooded area 85% lies in the Gangetic Delta and in the islands of the Bay of Bengal. In the other deltas, the mangroves, affected by an overhigh population density and excessive grazing, are highly degraded and are not of economic importance unless scientific forest management and pisiculture are undertaken. Practically every delta has a forest with distinct ecological and botanical traits. The total halophytic flora is rich; 58 major species have been enumerated. At present the more common species of the Indian mangroves are an aborescent member of the Euphorbiaceae, Excoecaria agallocha, and diverse species of Avicennia. These species have a great ecological amplitude and faculty for vegetative regeneration. The Rhizophora species, which show a poor resistance against strong biotic pressures, have become rare and have disappeared or tend to disappear, except in the Cauvery Delta and the Audaman Islands. (See also W79-02762) (Steiner-Mass)
W79-02774

WET COASTAL FORMATIONS OF INDO-MALESIA AND PAPUA-NEW GUINEA,
Auckland Univ. (New Zealand), Dept. of Botany.
V. J. Chapman.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p 261-270. 7 fig, 36 ref.

Descriptors: *Mangrove swamps, *Distribution patterns, Wetlands, Estuaries, Herbicides, 2,4-D, Ecological distribution, Sites, Crabs.

In Malaya the most extensive mangrove swamp forests are found in the Riau Islands south of Singapore, on the eastern shore of Sumatra, the southern and western shores of Borneo, and the southern coast of New Guinea. A number of rivers in the region are substantial with their lower reaches flowing over an extensive lowland. Tidal influence and mangroves can therefore extend up to 130-320 km inland. The community distribution in Indo-Malesia depends largely on physiography, salinity, soil type, degree of exposure, and drainage with frequency of inundation, age of swamp, and light as less signficant. On the Vietnamese coast, extensive mangrove swamps are found and are estimated to occupy 2800 sq km. The fauna is dominated by crabs present in large numbers which affect mangrove regeneration. With increase in latitude, mangrove species gradually disappear until only Kandelia candel remains in southern Japan. The various mangrove species in Vietnam have all proven susceptible to defoliation by a mixture of 2,4-D and Picloran. The sprayed may remain uncolonized for up to six years. Possible causes in delayed regeneration are: crab predators of seedlings, compaction of the soil after death of trees, or actual lack of seeding colonizers. (See also W79-02762) (Steiner-Mass)
W79-02775

MANGALS OF MICRONESIA, TAIWAN, JAPAN, THE PHILIPPINES AND OCEANIA,
Kyushu Univ., Fukuoka (Japan).
T. Hosokawa, H. Tagawa, and V. J. Chapman.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p 271-291. 12 fig, 10 tab, 70 ref.

Descriptors: *Mangrove swamps, *Distribution patterns, Wetlands, Estuaries, Ecological distribution, Sites, Coasts, Islands.

Mangrove swamps in Micronesia are not as extensive or well developed as those in the subtropical region further west. Considerable areas around all the high coastline, with large swamps in estuaries and filled lagoons. In Oceania, the development of mangroves is strictly influenced by the direction of the prevailng wind, the widest belts occur on the leeward coast and the narrowest on the windward coast of the island. Mangrove vegetation in Taiwan has generally developed in localities of quite seasonally dry climate, mainly in three sites along the northern and southwestern parts of the coast. The islands of Nansei-shoto of southwest Japan form stepping stones for mangroves from tropic Asia to the warm temperate region of Kyushu in Japan. The areas occupied by the mangrove forests and the diversity of species composition decrease with increasing latitude. At the northern limit and in adjacent areas, mangrove is represented by a stand of one species Kandelia candel. The mangrove ecosystems in Polynesia are essentially similar in their composition, but do not achieve extensive status. (See also W79-02762)(Steiner-Mass)
W79-02776

MANGAL AND COASTAL SALT-MARSH COMMUNITIES IN AUSTRALIA,
Queensland Univ., Brisbane (Australia). Dept. of Botany.
P. Saenger, M. M. Specht, R. L. Specht, and V. J. Chapman.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 293-345. 16 fig, 14 tab, 256 ref.

Descriptors: *Mangrove swamps, *Distribution patterns, *Salt marshes, Wetlands, Estuaries, Ecological distribution, Sites, Tidal marshes, Coastal marshes, Marshes, Marsh plants, Halophytes.

Mangorve vegetation is found around the coasts of all mainland states of Australia. In both species diversity and extent, the mangrove complex shows greatest development in northern tropical Australia where there are 27 tree species. Progressively fewer species, occupying smaller and smaller areas of the landscape, are found in the subtropical region, while only one specie, Avicennia marina, extends into the temperature region. Mangrove vegetation in New Guinea shows an even richer flora with the forests often reaching 30m or more in height. The large concentration of mangrove species and associated plants in the northwestern area of Australia can be attributed to three factors: this region was the origin of dispersal, the climatic region approximates that under which the mangrove vegetation first developed, and numerous estuaries provide large areas suitable for growth. Tidal salt marsh vegetation in contrast to mangrove vegetation, becomes increasingly more complex in structure and contain more species as latitude increases from tropical to temperate. Most dominant Australian salt marsh species have a wide geographical range, while a number, usually understory species, are confined to the temperature region. (See also W79-02762) (Steiner-Mass)
W79-02777

EXPLOITATION OF MANGAL,
Environmental Research Lab., Gulf Breeze, FL.
G. E. Walsh.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 347-362. 9 tab, 178 ref.

Descriptors: *Mangrove swamps, *Fish farming, *Economics, Land use, Wetlands, Estuaries, Productivity, Natural resources, Timber, Pulp and paper industry, Georgia, Publications, Forest management.

A literature review is made of the economic and ecological values with man's uses of mangrove swamps. Mangrove forests are among the most productive estuarine ecosystems, fixing as much energy as other estuarine systems, eutrophic ponds, evergreen forests, or good farmland. The stands serve as nurseries and food sources for many game and food fish. An acre, 0.405 ha, of undisturbed estuary yields an estimated $7,980 worth of commercial fish products in 20 years. The value of the Alcony River Swamp in Georgia, 930 ha in area, exceeds over seven million dollars a year in fisheries resources. For every acre of estuary filled or dredged, two additional acres are lost to fish production, yielding a total capitalized loss of $23,940 during 20 years. The mangrove forest is of considerable importance, not only as a source of firewood, charcoal, timber, and tannin, but also as a shoreline stabilizer. A recent development in mangrove utilization has been production of high-alpha pulps for the manufacturing of rayon, cellophane, lacquers, cellulose acetate, and other cellulose derivatives. (See also W79-02762) (Steiner-Mass)
W79-02778

HUMAN USES OF SALT MARSHES,
Maryland Univ., College Park. Chesapeake Research Lab.
W. H. Queen.
In: Ecosystems of the World 1: Wet Coastal Ecosystems, Elsevier Scientific Publishing Co., New York, 1977, p. 363-368. 29 ref

Descriptors: *Salt marshes, *Economics, *Marsh management, Wetlands, Coastal marshes, Fish management, Productivity, Shellfish, Commercial fisheries, Wildlife habitat, Waste water treatment, Estuaries, Marsh plants, Erosion control.

Present calculations of marsh value emphasize natural characteristics and processes revealed by ecological studies over the past several decades. These characteristics and processes many be grouped into four categories: biological production, aquaculture, waste-water assimilation, and other uses. Biologically, estuaries bordered by marshes, and coastal waters in the vicinity of extensive marsh-estuarine systems, are among the world's most productive waters in terms of both commercial and sport fisheries. Both estuarine shellfish and many coastal water finfish are doubly dependent on coastal salt marshes. Of equal importance with the habitat role is the function of marshes as producers of nutrient material, especially organic material. Economic demand has stimulated interest in increasing fish and shellfish production in estuarine waters by the use of aquaculture techniques. Althouh these techniques represent commercial exploitation of marshes, they are dependent upon the production of organic nutrients by marsh plants, a natural marsh process. Waste water assimilation by marsh plants has led to considerable speculation that marshes can be used to partially purify domestic waste water thereby reducing the need for tertiary sewage treatment. Other marsh characteristics useful to man are erosion control, prevention of damage resulting from tidal flooding, and the cycling of nitrogen and sulphur. (See also W79-02762) (Steiner-Mass)
W79-02779

ENVIRONMENTAL STUDIES OF KACHEMAK BAY AND LOWER COOK INLET, VOLUME VI: FOOD HABITS OF SHRIMP IN KACHEMAK BAY, ALASKA,
Rutgers - The State Univ., NJ. Dept. of Botany.
J. H. Crow.
Alaska Department of Fish and Game, Marine/Coastal Habitat Management, 33 p, 1977. 2 fig, 10 tab, 18 ref.

Descriptors: *Shrimp, *Alaska, *Food habits, Organic matter, Wetlands, Marshes, Diatoms, Algae, Crustacean, *Kachemak Bay(Alas), *Lower Cook Inlet(Alas).

Examination of the stomach contents of Pink, Coonstripe, and Sidestripe shrimp revealed that amorphous organic matter (detritus) and algae, mostly diatoms and fragments of macroalgae were the principal food sources. The stomachs also contained substantial amounts of invertebrate parts and grit; the former was mostly lacking protoplasm and probably of secondary importance as an energy source. The shrimp are apparently ingesting matter at or near the bottom since plankton samples taken concurrently did not correspond with stomach contents. Most of the diatoms and some of the macroalgae found in the stomachs are associated with the marsh-mudflat areas that are well represented in Kachemak Bay. (Steiner-Mass)
W79-02780

DENITRIFICATION IN A MASSACHUSETTS SALT MARSH,
Boston Univ., MA. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-02812

THE ECOLOGY OF PALAEMONETES PUGIO IN A SOUTHEASTERN SALT MARSH ECOSYSTEM WITH PARTICULAR EMPHASIS ON PRODUCTION AND TROPHIC RELATIONSHIPS,
South Carolina Univ., Columbia. School of Marine Science.
W. B. Sikora.
PhD Dissertation, 1977. 121 p.

Descriptors: *Salt marshes, *Shrimp, *Animal populations, Wetlands, Tidal marshes, Coastal marshes, Aquatic animals, Crustaceans, Growth rates, Aquatic habitats, Southeast U.S.

Grass shrimp, Palaemonetes pugio, populations of three salt marsh tidal creeks were sampled qualitatively and quantitatively and a population model was constructed to quantify the population dynamics over an annula cycle. Size-cohort analysis of the multivoltine, epibenthic adult population was undertaken to assess the growth, recruitment, and mortality and incorporate these data in the production model. Peak abundance was found to occur in late fall and the lowest numbers in late spring. Two spawning periods per year were found with the individual life span being less than one year. Growth rates over time and size classes were quite constant. Total annula egg production was 9.2% of the total annual production of females. Production of males, females and eggs was estimated by monthly intervals over an annual cycle. The subadult and adult stages of the shrimp were found to utilize an intertidal habitat. The tidal migrations of the shrimp were measured. By combining tidal data with shrimp migration data, an estimated of habitat utilization was obtained which indicated the shrimp spend most of the time within the intertidal creek bank area. (Steiner-Mass)
W79-02821

PH FLUCTUATION IN AN INTERTIDAL BEACH IN BERMUDA,
Innsbruck Univ. (Austria). Inst. fuer Zoophysiologie.
E. Gnaiger, G. Gluth, and W. Wiesser.
Limnology and Oceanography, Vol. 23, No. 5, p 851-857, September 1978. 5 fig, 1 tab, 55 ref.

Descriptors: *Alkaline water, *Hydrogen ion concentration, *Beaches, On-site investigations, On-site data collections, Laboratory tests, Shores, Alkalinity, Sediments, Water chemistry, Light, Temperature, Water temperature, Correlation analysis, Data processing, Fluctuations, *Bermuda.

Unusually high pH values up to 9.6 measured during low tide in a calcareous sandy beach were correlated with high in situ temperatures. Daily flucutations of up to 1.5 pH units are limited to the topmost layer of sediment. Light, by controlling photosynthesis, is the causal factor in determining high pH at the surface; subsurface sediments do not respond to experimental light changes. Indications of such fluctuations are lacking in the litera-

ture. These fluctuations could influence community respiration. (Sims-ISWS)
W79-02842

A RAPID AND PRECISE METHOD FOR DETERMINING SULFATE IN SEAWATER, ESTUARINE WATERS, AND SEDIMENT PORE WATER,
Woods Hole Oceanographic Institution, MA. Joint Program in Biological Oceanography.
For primary bibliographic entry see Field 2K.
W79-02846

MICROFLUOROMETRIC METHOD TO MEASURE AMMONIUM IN NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 2K.
W79-02847

SOLAR MIDDLE ULTRAVIOLET (UV-B) MEASUREMENT IN COASTAL WATERS RICH IN YELLOW SUBSTANCE,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
N. K. Hojerslev.
Limnology and Oceanography, Vol. 23, No. 5, p 1076-1079, September 1978. 5 fig, 1 tab, 9 ref.

Descriptors: *Irradiation, *Oceans, *Ultraviolet radiation, *Instrumentation, Equipment, Radiation, Measurement, Transmissivity, Coasts, On-site investigations, Oceanography, Downwelling irradiance.

The properties of a Danish UV-B meter and a Robertson UV-B meter, designed for underwater use, were discussed. Measurements of the radiant energy in the UV-B region in waters rich in yellow substance were performed appropriately by means of the Danish UV-B meter only. (Sims-ISWS)
W79-02849

FINE STRUCTURE INSTABILITIES INDUCED BY DOUBLE DIFFUSION IN THE SHELF/SLOPE WATER FRONT,
City Univ. of New York. Inst. of Marine and Atmospheric Sciences.
E. S. Posmentier, and R. W. Houghton.
Journal of Geophysical Research, Vol. 83, No. C10, p 5135-5138, October 20, 1978. 6 fig, 7 ref. ERDA EY76-S-02-2186.

Descriptors: *Stability, *Sea water, *Continental shelf, *Diffusion, *Atlantic Ocean, Salinity, Temperature, Water temperature, Density, Continental slope, Mixing, Salts, On-site investigations, On-site data collections, Data processing, Analytical techniques, Oceans, Oceanography, *New York bight.

Intervals of negative stability were observed which appear as part of distinct loops in the T-S diagram of CTD hydrographic stations near the shelf break in the New York Bight. These features occur within the shelf break frontal zone, which is associated with active interleaving between warm, salty slope water and cooler, fresher shelf water. Double-diffusive mixing was proposed as the mechanism responsible for the observed T-S correlations. (Sims-ISWS)
W79-02851

POOLS OF NITROGEN IN A GEORGIA SALT MARSH,
Georgia Univ., Athens.
For primary bibliographic entry see Field 5C.
W79-02899

DETRITUS AS FOOD FOR ESTUARINE COPEPODS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Henie, R. P. Harris, J. F. Ustach, and D. A. Flemer.
Marine Biology, Vol. 40, p 341-353, 1977. 1 fig, 10 tab.

Descriptors: Marshes, *Detritus, *Copepods, Marsh production, Estuaries, Nutrients, Estuarine animals, *Marsh plants, Food chains, Carbon balance.

A variety of detrital foods derived from marsh plants were fed to the copepods Eurytemora affinis and Scottolana canadensis. The copepods did not survive well or produce eggs when feeding on detritus with smaller amounts of microbiota, but did well when a rich and abundant microbiota was present. Ciliated protozoans appear to be particularly important in the transfer of detrital energy to copepods.
W79-02916

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE NEW YORK BIGHT, FIRST AND SECOND MONITORING CRUISES, NOVEMBER 1975 AND MARCH 1976,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W79-02922

MANAGING OIL AND GAS ACTIVITIES IN COASTAL ENVIRONMENTS,
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-02931

SALT MARSH PLANT GERATOLOGY,
Georgia Univ., Brunswick. Marine Extension Service.
For primary bibliographic entry see Field 2I.
W79-02932

THE SEED BANKS OF PRAIRIE GLACIAL MARSHES,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 2I.
W79-02933

PLANT STANDING CROP AND PRODUCTIVITY RELATIONS IN A SCIRPUS-EQUISTUM WETLAND,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-02936

CONTRIBUTION OF CHRONIC PETROLEUM INPUTS TO NARRAGANSETT BAY AND RHODE ISLAND SOUND SEDIMENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W79-02942

STUDIES OF THE INVERTEBRATE FAUNA OF A WET SLACK IN A SAND DUNE SYSTEM,
A. M. Bevercombe, N. Cox, M. P. Thomas, and J. O. Young.
Archiv Hydrobiologie, Vol. 71, No. 4, p 487-516, 1973. 6 fig, 5 tab, 50 ref.

Descriptors: *Wetlands, *Zooplankton, *Benthic fauna, Dunes, Invertebrates, Aquatic animals, Drought tolerance.

Geographical, physical, and chemical data from Massam's Slack--a wet dune slack subject to periodic drying out--are given and the seasonal abundance and distribution of the zooplankton and zoobenthos is described. The species of zooplankton occurring in the slack are typical of shallow waters containing abundant vegetation. Most of the species present, however, have minor differences in life history depending on whether they occur in the slack pool or skirting drainage ditch. The zoobenthos is divided into three groups: animals which survive and multiply while conditions are favorable but perish when drought occurs; animals which leave the slack when conditions become dry; and animals capable of surviving a period of drought. (Steiner-Mass)
W79-02948

FACTORS CONTROLLING THE AVAILABILITY OF SEDIMENT-BOUND LEAD TO THE ESTUARINE BIVALVE SCROBICULARIA PLANA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W79-02961

SEASONAL PHYTOPLANKTON PRODUCTION IN THE WESTERN ENGLISH CHANNEL 1964-1974,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W79-02963

AN EXPOSURE SCALE FOR MARINE SHORES IN WESTERN NORWAY,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-02964

NUTRIENT REGENERATION BY ZOOPLANKTON DURING A RED TIDE OFF PERU, WITH NOTES ON BIOMASS AND SPECIES COMPOSITION OF ZOOPLANKTON,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02975

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS. SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Lab., Delft (Netherlands) and Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
C. B. Vreugdenhil, and J. Voogt.
Presented at ASCE Symposium on Modeling 75, held in San Francisco, CA, on 3-5 September, 1975. Publication no. 155, December 1975. 1 fig, 26 ref.

Descriptors: *Estuaries, *Coasts, *Hydrodynamics, *Turbulent flow, *Water quality, Mathematical models, Water transport.

An analysis is given of the assumptions in different types of mathematical models for the transport of water and other quantities in estuaries and coastal waters. The starting point is formed by the equations for three-dimensional turbulent flow. An estimate of the importance of various terms is given. By several averaging processes, increasingly simpler models are obtained, but the interpretation of coefficients becomes increasingly more difficult. Also the numerical possibilities are discussed, with special emphasis on aspects of accuracy and nonlinear stability which are considered the most important numerical problems. Attention is limited to nearly horizontal flow, although the influence of short waves on these flows is also treated. In the discussion the parallel between momentum and mass transfer (hydrodynamics and water quality) is taken into account. (Sinha - OEIS)
W79-02983

CORRELATIONS OF FISH CATCH AND ENVIRONMENTAL FACTORS IN THE GULF OF MAINE,
Bedford Inst. of Oceanography, Darthmouth(Nova Scotia). Marine Ecology Lab.
W. H. Sutcliffe, Jr., K. Drinkwater, and B. S. Muir.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 19-30, 1977. 62 ref.

Descriptors: *Commercial fish, *Commercial shellfish, *Water temperatures, *Fluctuations, Fish

management, Correlation analysis, *Environmental effects, *Marine fisheries, Maine, Air temperature, Atlantic Ocean, Fishing effort, St. Lawrence River discharge, Catch prediction, Marine environment, *Gulf of Maine.

In an investigation of catches of 17 commercial marine species of fish and shellfish from the Gulf of Maine, 10 showed statistically significant correlations with sea temperatures at St. Andrews, N.B., or Boothbay Harbour, Maine. Most fish records contained at least 40 yr. of data. Descriptive equations are produced for four species based first on the correlation between catch and sea temperature and second on the correlation between catch and sea temperature allowing for fishing effort. Inclusion of fishing effort, improved the correlations for all of the species examined. The equations permitted the 'prediction' of later parts of the records from earlier parts. Considering the fish species collectively, the Gulf of Maine system from 1940 to 1959 appeared to be in equilibrium with litle fluctuation in the total commercial biomass. The large fluctuations in individual species abundance are interpreted as resulting from a combination of fishing pressure and to a significant degree oceanic climate as represented by sea temperature. The small fluctuations in the total biomass displays the species variation, with their differing climatic 'preferences,' as well as possible predator (including man)-prey relationships. Environmentally imposed patterns underlie at least 50% of the fluctuations in catch of many species and the understanding of these fluctuations is basic to effective management. (Katz)
W79-02997

THE PRESENCE OF POLLUTANT HYDROCARBONS IN ESTUARINE EPIPELIC DIATOM POPULATIONS,
Bristol Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 5C.
W79-02998

HIGH-MAGNESIUM CALCITE OOIDS FROM THE GREAT BARRIER REEF,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
J. F. Marshall, and P. J. Davies.
Journal of Sedimentary Petrology, Vol. 45, No. 1, March 1975, p 285-291, 5 fig, 13 ref.

Descriptors: *Petrology, *Sedimentary petrology, Sediments, Petrofabrics, Magnesium compounds, Magnesium, Calcite, *Australia, X-ray analysis, *Ooids, *Great Barrier Reef.

Ooids are repoted from the Great Barrier Reef as occurring over an area of 340 sq km as unconsolidated sediments in water depths of 100-120 m. There is no direct evidence on the age of the ooids but some circumstantial evidence points to an early Holocene age. X-ray diffraction analysis and electron probe studies indicate that they are composed of high-magnesium calcite. The ooids show well defined concentric, radial, and granular fabrics with all three fabric types occurring in the cortex developed around polycrystalline nuclei. Two possible alternatives for the origin of the ooids are suggested: either they were precipated originally as aragonite and have been subsequently replaced by high-Mg calcite, or they were precipated originally as high-Mg calcite. Evidence for the two hypotheses is discussed. (Chilton-ORNL)
W79-02999

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DEVELOPMENT OF A 50,000 GPD SEAWATER REVERSE OSMOSIS PILOT PLANT BASED ON CELLULOSE TRIACETATE HOLLOW FINE FIBERS,
Dow Chemical U. S. A., Walnut, CA. Western Div. Research Labs.
R. D. Ammons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 158, Price codes: A12 in paper copy, A01 in microfiche. Final Report, OWRT/S--78/9, September 1978. 270 p, 33 fig, 20 tab, 5 append. OWRT/S--78/9(No. 3188)(1).

Descriptors: Sea water, *Desalination, *Membrane processes, *Reverse osmosis, Membranes, Filtration, Cellulose triacetate hollow fibers, Pilot plants, Economics, Wrightsville Beach Test Facility(NC), Pretreatment studies, Diatomaceous earth filtration.

The objectives were to develop a commercially attractive seawater desalting module based on cellulose triacetate hollow fine fibers, determine the level of pretreatment necessary to maintain good module performance, and demonstrate the economics and feasibility of reverse osmosis for seawater desalinatin by constructing and operating a 50,000 GPD pilot plant at the Wrightsville Beach Test Facility. Development and testing of eight-inch (2500 GPD) modules was highly successful, and the product water cost ($3.40-$4.00 per 1000 gal. based on three-year membrane life) was low enough to assure that reverse osmosis will gain acceptance in seawater desalting. An expanded pretreatment study became necessary and resulted in development of diatomaceous earth filtration as an economically competitive and technically superior alternative to sand filtration for pretreating feedwater. Development of a larger reverse osmosis module was not commercially successful,but the ground work was laid for future work.
W79-02676

DESALINATION TECHNOLOGY TRANSFER CENTER,
Fairleigh Dickinson Univ., Teaneck, NJ. Coll. of Science and Engineering.
R. Bakish.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 478, Price codes: A02 in paper copy, A01 in microfiche. Final Report, August 31, 1978. 11 p, 1 larg. diag. OWRT T-0018(No. 7704)(1).

Descriptors: Desalination, *Technology transfer, Desalination apparatus, *Virgin Islands, *Desalination plants, Information exchange, Waste water treatment.

A Desalination Technology Transfer Center was established at the West Indies Laboratory of Fairleigh Dickinson University. Surplus equipment from OWRT's facilities in Wilmington, N. C. was moved to St. Croix and installed in specially constructed 30-by 60-ft partially roofed concrete pad. Water intake to feed the system was installed as was a new power supply line to serve the system. In addition, complete pretreatment train was placed in service suitable for use in demonstration, research and development. The system has the capability of feeding up to four 1500 gpd RO modules. At time of completion of the contract the system was capable of feeding the RO modules with water with silting density index lower than 3.
W79-02840

3B. Water Yield Improvement

WEATHER MODIFICATION ACTIVITIES IN TEXAS, 1974-77.
Texas Dept. of Water Resources, Austin. Weather Modification and Technology Section.
Report 219, August 1978. 85 p, 35 fig, 27 tab.

Descriptors: *Weather modification, *Cloud seeding, *Projects, *Texas, Precipitation(Atmospheric), Rainfall, Rain, Hail, Silver iodide, Aircraft, Contracts, Administration, Legal aspects, Permits, Weather, Cloud physics, Meteorology, Water resources.

The State of Texas joined a number of other states which enacted weather modification legislation during the 1960's with enactment in 1967 of the present Texas Weather Modification Act. Under provisions of this Act, the Texas Water Development Board was charged with the administration of the Act. Effective September 1, 1977, Texas' three water resources agencies, the Texas Water Rights Commission, the Texas Water Development Board, and the Texas Water Quality Board, were consolidated to form the Texas Department of Water Resources. The authority for regulating weather modification activities in Texas was transferred to the new Department on that date. An outstanding feature of the authority given the Department by the Act relates to a weather modification license and permit system. The Act requires that potential weather modifiers first obtain a license and a permit before beginning a project. This report described those activities which were conducted during the period 1974-77 under licenses and permits. No attempt was made in this report to analyze the degree of success or failure of these activities. The great variability of natural weather phenomena in Texas makes results extremely difficult to ascertain. A number of years is usually required before the results of a particular program can be determined. (Sims-ISWS)
W79-02699

WATER CONSERVATION INFORMATION DISSEMINATION DURING THE 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan
L. D. James, and W. H. Andrews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 474, Price codes: A13 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Water Resources Planning Series Report P-78-002, June 1978. 235 p, 27 tab, 3 append. OWRT T-0021(7706).

Descriptors: *Droughts, *Water conservation, Range management, *Water harvesting, Water reuse, Groundwater mining, Irrigation, Erosion, *Information exchange, *Information dissemination, Water distribution(Applied), Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

As drought conditions in 1976 and 1977 became increasingly severe throughout the west and affected many other parts of the country, many states began special drought information dissemination efforts. This study was organized to provide a forum for the exchange of information among the respective states that could reduce duplication among independent efforts. The project collected information on: (A) Water-user conservation practices, (1) domestic use, (a) inside use, (b) outside use, (2) industrial, (3) commercial, and (4) irrigation; (B) Water-supplier management practices, (1) water conservation inducements, (2) emergency supply augmentation, (a) groundwater mining, (b) water harvesting, (c) water reuse, (3) reallocation among uses or users; (C) special drought problems, (1) livestock and range management, (2) effects on fish and wildlife, (3) fire danger, (4) effects on recreation, (5) energy effects (reduced generation and additional use), (6) effects of resulting changes in water quality including salinity, and (7) wind erosion. Types of information included (1) research results contributing to dealing more effectively with emergency drought situations, (2) research currently underway, (3) brochures or other material prepared for public distribution, (4) reports of extension agents or other technical personnel working with the public to solve drought problems, and (5) user or expert statements recommending supplementing or revising any of the above. This report contains 667 abstracts and a snythesis of the information obtained on each topic.
W79-02904

3C. Use Of Water Of Impaired Quality

EVALUATION OF MEASURES FOR CONTROLLING SEDIMENT AND NUTRIENT LOSSES FROM IRRIGATED AREAS,
Idaho Agricultural Experiment Station, Moscow.
For primary bibliographic entry see Field 5G.
W79-02501

'BEST MANAGEMENT PRACTICES' FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02521

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1976, SIXTH ANNUAL ISSUE,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 10C.
W79-02580

EVALUATION OF IRRIGATION METHODS FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02594

IMPLEMENTATION OF AGRICULTURAL SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02617

INTEGRATING DESALINATION AND AGRICULTURAL SALINITY CONTROL ALTERNATIVES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02629

LAS VEGAS VALLEY WATER BUDGET: RELATIONSHIP OF DISTRIBUTION, CONSUMPTIVE USE, AND RECHARGE TO SHALLOW GROUNDWATER,
Nevada Univ. System, Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 5G.
W79-02728

DEVELOPING PROCEDURES FOR PREDICTING EFFECTIVENESS IN SEEPAGE CONTROL,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 4A.
W79-02820

RESPONSES OF BERMUDAGRASS TO SALINITY,
California Univ., Riverside. Dept. of Plant Sciences.
R. C. Ackerson, and V. B. Youngner.
Agronomy Journal, Vol. 67, No. 5, p 678-681, September-October 1975. 6 tab, 27 ref.

Descriptors: *Bermudagrass, *Crop response, *Salinity, Turf grasses, Turf, *Salt tolerance.

Bermudagrasses are salt-tolerant grasses valuable for forage and turf. Experiments were conducted to determine specific responses to increasing salinity to provide a basis for breeding of more salt tolerant, agronomically desirable strains. The cultivar 'Santa Ana' was grown in solution cultures containing increasing levels of NaCl and CaCl2 or K2SO4. Dry weight of tops decreased while dry weight of roots and total nonstructural carbohydrate concentrations of crowns, but not roots, increased with increased salinity of the culture solution. (Skogerboe-Colo St)
W79-02993

3D. Conservation In Domestic and Municipal Use

A PROCEDURE TO DETERMINE DIRECT DIVERSIONS FROM LAKE MICHIGAN,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
J. W. Male, and K. Soliman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 365, Price codes: A04 in paper copy, A01 in microfiche. University of Illinois Water Resources Center, Urbana, Research Report No. 137, October 1978. 71 p, 8 fig. 12 tab. 3 ref. S-061-ILL.

Descriptors: *Mathematical models, *Optimization, Water utilization, Regulated flow, Diversion, Flow augmentation, Decision making, Water management, Water resources, Water quality, *Lake Michigan, *Diversion, *Illinois, *Algorithms.

Illinois diverts water from Lake Michigan to the Chicago River and Canal System in three primary ways: (1) diversions for municipal water supply, (2) storm water diverted away from the lake, and (3) direct diversions primarily for water quality purposes. The U.S. Supreme Court has ruled that the total average diversion must not exceed 3200 cfs. Since the stormwater diversion is uncontrollable, by reducing the amount necessary for direct diversion, the diversion available for municipal use can be increased. An optimization procedure, utilizing an efficient network algorithm, is developed to determine the average monthly flowrates at the three diversion points on Lake Michigan. The algorithm minimizes the total amount diverted that is necessary to maintain the dissolved oxygen standard in the waterway system. The procedure is applied to evaluate direct diversion needs under existing conditions and after installation of ten instream aeration stations. Results show the need for large diversions during the summer months and primarily at one diversion point. The installation of instream aerators reduces the need for direct diversions by approximately 25 percent.
W79-02523

HYDROLOGIC DATA FOR URBAN STORM RUNOFF FROM THREE LOCALITIES IN THE DENVER METROPOLITAN AREA, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02646

NEW CONSIDERATIONS FOR MUNICIPAL WATER SYSTEM PLANNING,
Montgomery (James M.)
For primary bibliographic entry see Field 6B.
W79-02729

IRRIGATION OF URBAN LAWNS,
Colorado State Univ., Ft. Collins. Dept. of Agricultural and Chemical Engineering.
P. M. Haw.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 393, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, Spring 1978. 80 p, 7 fig, 8 tab, 25 ref, 2 append. OWRT B-035-WYO(3).

Descriptors: Irrigation, *Evapotranspiration, Urban lawns, *Lawn irrigation, Sprinkler irrigation, *Lysimeters, Measurement, Cities, *Urbanization, Water utilization, *Colorado.

Using small weighable lysimeters, evapotranspiration of urban lawns was measured in Fort Collins and Northglenn, Colorado during the summer of 1977. The measured data were compared with the Modified Blaney-Criddle equation estimated evapotranspiration lower than the measured data. The Jensen-Haise equation predicted weekly evapotranspiration reasonably well, provided allowance was made for plant stress, growth stage and availability of water after an irrigation. Lawn irrigation practices of the residents of 57 homes in Fort Collins and Northglenn were studied in the summer of 1977. The water applied to the lawns and gardens of these homes was measured. The total water supplied to 30 homes in Northglenn was also measured. Lawn water application rates were compared to: (1) measured evapotranspiration; (2) physical appearance of lawns, and (3) total residential water use. Recommendations are made concerning lawn water application rates in Denver and the use of small lysimeters and water meters in urban lawn studies. These recommendations are: (1) investigate the accuracy of using shallower lysimeters than were used in this study, (2) determine lawn sizes and outside water use patterns more accurately, and (3) compile an instruction manual for urban lawn irrigation.
W79-02832

3E. Conservation In Industry

ELIMINATION OF WATER POLLUTION BY RECYCLING CEMENT PLANT KILN DUST,
Portland Cement Association, Skokie, IL.
For primary bibliographic entry see Field 5D.
W79-02509

RESOURCE DEMANDS FOR ENERGY DEVELOPMENT IN THE YELLOWSTONE RIVER BASIN,
CH2M/Hill, Sacramento, CA.; and North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 6D.
W79-02726

FACTUAL INPUTS FOR ALLOCATION DECISIONS CONCERNING SCARCE WATER RESOURCES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 6B.
W79-02731

ENERGY RESOURCES DEVELOPMENT, (COLORADO RIVER BASIN),
Department of the Interior, Washington, DC.
J. Carter.
In: Values and Choices in the Development of the Colorado River Basin, edited by D. F. Peterson and A. B. Crawford, p. 144-155, 1978. University of Arizona Press, Tucson. 1 fig, 1 tab.

Descriptors: *Energy, *Colorado River basin, *River basin development, Fossil fuels, Coals, Oil shales, Solar energy, Geothermal energy, Economics, Government, Hydroelectric power, Energy budget, Economic impact, Economic justification, Economic feasibility, Political constraints, Water resources development.

Projections for future energy needs have led to increased interest in the energy resources of the Colorado River Basin. Accordingly, the U. S. Department of the Interior has created an energy policy for future development by encouraging coal and oil shale technology and resources data throught leasing programs and r and d projects. Although solar, geothermal, coal, and oil shale development of the area is expected, it is this author's contention that these efforts, along with conservation programs, will not greatly alter the energy situation sufficiently to avoid an increased dependence on foreign sources by 1980. Even though oil, gas, and hydroelectric power is available in the Basin, developmental and environmental problems make it doubtful that these resources will be a major source of energy for the next several

years. The Federal Government, nevertheless, is moving quickly to faciliate the development of the region's energy resources at acceptable economic and environmental costs, regardless of the difficulty of the decisions that must be made. Water, costs, and socioeconomic problems of the Basin's development form the basin of this discussion. (See also W79-02732). (Tickes-Arizona).
W79-02737

PROBABILISTIC ANALYSIS OF WATER AVAILABILITY IN POWER PLANT SITE SELECTION,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
D. M. Wong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 407. Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, 1974. 63 p, 13 ref, 2 append. OWRT A-043-ARIZ(2), 14-31-0001-4003.

Descriptors: *Cooling water, Information retrieval, *Nuclear powerplants, Water reuse, *Probability, *Sites, *Powerplant site selection, Water supply, Water availability, *Forecasting, *Arizona, Groundwater basins, Water demand, Projections, Southwest U.S.

A method of probabilistic analysis of long-term water availability for power plant site selection was developed. A standard site selection process was followed, in which the factors affecting siting were identified, weighted by their importance, and compared by location, the basic techniques being the system screening and ranking processes. The potential physiographic/groundwater basins were initially screened with reference to specific site selection requirements. Then a probabilistic value predicting water availability of sufficiency was obtained, by (1) estimating and projecting the quantity of water available in each candidate valley for the lifetime of the plant (assumed to be 30 years) by a probabilistic mathematical model; and (2) calculating the total quantity of cooling water required for the lifetime of the plant, by estimating the annual cooling demand assuming a 1000 MWe light water reactor power plant design. Twenty-four groundwater basins in Arizona were listed as potential areas where groundwater storage may be sufficient as a source of supply for the projected 30-year life of a power plant. After screening with respect to land availability and seismic characteristics, the list was reduced to seven basins or valleys, of which three were then selected arbitrarily for detailed examination.
W79-02834

3F. Conservation In Agriculture

ASSESSING THE SPATIAL VARIABILITY OF IRRIGATION WATER APPLICATIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
D. Karmeli, L. J. Salazar, and W. R. Walker.
Publication No. EPA-600/2-78-041, March, 1978. 201 p, 38 fig, 25 tab, 71 ref, 6 append.

Descriptors: *Irrigation efficiency, *Sprinkler irrigation, *Irrigation practices, *Irrigation water, Trickle irrigation.

The current state of the art regarding the spatial distributions of irrigation water applications under surface, sprinkler, and trickle irrigation systems has been assessed. The analyses found in the literature and several new uniformity concepts have been integrated into models which can be used in both field and research applications. These models simulate the spatial distributions of applied irrigation water under specified design and operating conditions. The performance of an irrigation system has been described by a series of 'quality' parameters relating to: (1) uniformity in an irrigated field; (2) adequacy of the irrigation system in meeting crop requirements; (3) volume of applied water wasted as deep percolation; and (4) in the case of surface irrigation, the water leaving the field as tailwater. Verification of the models developed during this project was made against most of the data identified in the literature as well as an intensive collection effort as part of this project. The results illustrate both the use of the analytical approach and the procedures for field data collection. (Skogerboe-Colorado State)
W79-02632

A PROGRAM TO PROMOTE IRRIGATION CONSERVATION IN IDAHO,
Idaho Dept. of Water Resources, Boise.
J. R. Hammond.
March 1978. 43 p, 6 fig.

Descriptors: *Irrigation efficiency, *Irrigation conservation, Irrigation incentives, *Idaho, Idaho Irrigation Conservation Program, Water delivery organizations, Water law, Costs, Benefits, *Water conservation.

Studies have shown that many irrigators in Idaho employ more water conserving systems and practices than others. Similar observations have been made among water delivery organizations. While physical considerations influence the extent that more efficient systems and practices are employed, they do not fully explain differences in irrigation efficiency. Economic, social, legal and institutional factors are examined to determine their effects on irrigation efficiency. The direct and indirect costs and benefits of improving irrigation efficiency are discussed. The benefits which some users may derive from the waste, seepage or return flow waters of others are also discussed. The right to conserve and use conserved water is examined. The trend toward the adoption of water conserving improvements in Idaho is discussed. The impacts of existing state and federal programs on irrigation conservation are examined. A goal for irrigation conservation is defined to include the positive and negative impacts of improving efficiency. Three levels of emphasis (low, moderate, aggressive) are compared for developing a state irrigation conservation program in light of the irrigation conservation goal. Based on the evaluation of the three programs it is recommended that a low emphasis program be adopted and that a more aggressive program not be implemented until the positive and negative impacts of improving irrigation efficiency can be more clearly established.
W79-02671

OPTIMIZING IRRIGATION SYSTEM DESIGN,
Idaho Dept. of Water Resources, Boise.
G. D. Galinato, J. R. Busch, and C. E. Brockway.
Completion Report, June 1977. 266 p, 20 ref, 5 append. Bur. Reclam. 14-06-100-9087.

Descriptors: *Irrigation systems, *Optimization, Planning, Rehabilitation, *Idaho, Cost analysis, *Irrigation efficiency, *Irrigation design.

A method of rapidly obtaining optimal irrigation system designs has been developed for use by planning personnel of the Bureau of Reclamation, Pacific Northwest Region. The method allows planners to obtain optimal system designs for various specified irrigation efficiencies and water costs and to rapidly evaluate the effects of changes in these parameters in conjunction with physical and socioeconomic constraints. Cost estimating routines are used to obtain annual costs associated with canal and pipeline sections, pumping units and on-farm application systems. The optimization procedure is a two-stage dynamic-linear programming approach. Dynamic programming is first used to eliminate undesirable conveyance system components, and linear programming is then used to obtain the optimal system design of all conveyance and application components. Component and water costs and various constraining conditions are easily changed in the linear-programming problem to allow planners to evaluate many aspects in multi-objective planning. The entire procedure has been used to develop alternative plans for a portion of a Bureau project. The results obtained are least cost systems that are compatible with Bureau planning guidelines. The procedure may be used for developing optimal system plans for rehabilitation projects as well as for new projects.
W79-02672

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF NUTRIENTS, A RAINFALL SIMULATION STUDY,
Iowa Natural Resources Council, Des Moines.
For primary bibliographic entry see Field 4C.
W79-02680

SOCIAL OVERHEAD CAPITAL COSTS OF IRRIGATION DEVELOPMENT IN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
N. K. Whittlesey, K. C. Gibbs, and W. R. Butcher.
Water Resources Bulletin, Vol. 14, No. 3, p 663-678, June 1978. 2 fig, 4 tab, 7 ref.

Descriptors: *Irrigation development, *Energy, *Social overhead costs, Water resources, Capital costs, Columbia Basin(Washington), Projects, Taxes, Utility rates, Demand.

Increased irrigation as a means of achieving economic development can impose significant social costs on the state or region of growth. The growth in population induced by additional irrigation will require new roads, water and sewage facilities, schools, fire and police protection, and so forth. Also, the increased energy demands due to irrigation and growth in economic activity must be met. Capital investments required to service these needs of new development can become very large. This study attempts to measure such social overhead costs or irrigation development for some specific irrigation project areas of Eastern Washington. It is shown that investment costs in overhead items can reach $2,000 per acre irrigated or $70,000 per job created. Alternatively, the annual costs can equal $180 per acre or $6,700 per worker. These costs must be paid locally through increased taxes, utility rates, or costs for services. (Bell-Cornell)
W79-02719

FACTUAL INPUTS FOR ALLOCATION DECISIONS CONCERNING SCARCE WATER RESOURCES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 6B.
W79-02731

THE ROLE OF AGRICULTURE. (COLORADO RIVER BASIN),
New Mexico State Univ., University Park.
G. W. Thomas.
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p 156-172. University of Arizona Press, Tucson. 1978. 1 tab, 1 fig, 23 ref.

Descriptors: *Colorado River Basin, *Land use, *Agriculture, *Multiple purpose, Foods, Land tenure, Variability, River basin development, Economic justification, Alternative planning, Planning, Future planning(Projected), Regional analysis, Economic impact, Cost-benefit analysis, Economic feasibility, Grazing.

The demand for land to develop energy, mineral, recreational, and environmental resources in the Colorado River Basin is expected to increase competition with agricultural and grazing enterprises. Conversely, need for food and fiber, as well as the U.S. reliance on agricultural exports for foreign exchange, are external forces being exerted upon the allocation of the region's lands. Here the context in which agricultural decisions, public and private, must be made, and the relation of these to the resource base of the region are reviewed. Uncultivated lands account for the largest acreage in the Basin, and are of use for timber production, livestock grazing, recreation, wildlife, wilderness, watersheds, and minerals. Land use and management decisions on these lands are complicated by three major factors: (1) land ownership patterns,

(2) extreme variability in climate, soils, vegetation, and topography, and (3) multiple-use possibillities. In termas of land area, the dominant agricultural use in the region is for grazing and timber. Prospects and problems involving the water and energy demands on these uncultivated lands of the Basin are reviewed. (See also W79-02732). (Tickes-Arizona).
W79-02738

SOIL AND WATER LOSS FROM CONSERVATION TILLAGE SYSTEMS,
Science and Education Administration, Ames, IA. North Central Region.
J. M. Laflen, J. L. Baker, R. O. Hartwig, W. F. Buchele, and H. P. Johnson.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 5, p 881-885, September-October 1978. 5 fig, 2 tab, 11 ref.

Descriptors: *Soil erosion, *Runoff, *Iowa, *Farm management, *Soil conservation, Sediments, Mulching, Corn, Simulated rainfall, Soils, Soil types, Rainfall, Crops, Agriculture, *Tillage practices, Residue cover.

A rainfall simulator was used to evaluate the effects of 6 different tillage practices on soil and water losses from continuous corn for 3 soils in Iowa. Soil loss decreased as tillage decreased. Percent of soil covered by corn residue explained between 78 and 89% of the variance in erosion among tillage systems. The effect of nonuniformly distributed corn residue on controlling erosion was greater than expected based on a published mulch factor. Runoff amounts decreased as residue cover increased for 2 of the 3 soils studied. No critical slope length limits were found for the tillage practices, soils, slopes, and slope lengths studied except for till-planting on the Ida soil. As sediment concentrations increased, mean sediment size increased for one soil, decreased for a second soil, and was unrelated to sediment concentration for the third soil. (Sims-ISWS)
W79-02852

GRAVITY-FLOW IRRIGATION AND THE SPREAD OF AQUATIC WEEDS IN SUDAN,
Gezira Univ., Wad Medani (Sudan). Dept. of Biological Sciences.
For primary bibliographic entry see Field 4A.
W79-02930

RESISTANCES TO WATER TRANSPORT IN RICE PLANTS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
For primary bibliographic entry see Field 2I.
W79-02986

YIELD AND QUALITY OF CORN AND GRAIN SORGHUM GRAIN AND RESIDUES AS INFLUENCED BY N FERTILIZATION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
L. J. Perry, Jr., and R. A. Olson.
Agronomy Journal, Vol. 67, No. 6 p 816-818, November-December 1975. 3 tab, 12 ref.

Descriptors: *Grain sorghum, Corp response, *Corn(Field), *Nitrogen, *Fertilizers, *Fertilization, *Crop production, *Crop residues.

Crop residues of grain sorghum and corn have attracted attention as an alternate economical forage resource for livestock utilization. There are little data available on agronomic production factors affecting yield and quality of crop residues. The effect of rate and time of N fertilizaton on irrigated corn and grain sorghum grain and residue yields, grain N content, and forage quality of the residues was evaluated. It was concluded that N rate and time of application do affect yield and quality of row crop residues. (Skogerboe-Colo St)
W79-02987

RESPONSE CURVES OF VARIOUS TURFGRASSES TO APPLICATION OF SEVERAL CONTROLLED-RELEASE NITROGEN SOURCES,
Florida Univ., Gainesville. Dept. of Soil Science.
G. M. Volk, and G. C. Horn.
Agronomy Journal, Vol. 67, No. 2, p 201-204, March-April 1975. 6 fig, 9 ref.

Descriptors: Turf, *Turf grasses, *Nitrogen, *Fertilizers, Fertilization, Ureas, *Crop response, Crop production.

Responses of turfgrasses to controlled-release N sources, especially the newer materials have not been adequately evaluated under field conditions. This study obtained N time-release curves as measured by clippings taken periodically after the initial response to readily available N such products contain had subsided. Materials were surface-applied once, or at widely spaced intervals, to six different turfgrasses. Three to 4-day growth clippings were taken periodically to assess current N uptake rate against that from a standard treatment consisting of a continuous, uniform, weekly application of NH4NO3. Sulfur-coated urea gave the most desirable response for summer fertilization, followed by isobuthlidene diurea (IBOU), activited sewage sludge and urea form. IBOU was superior to the other materials for winter usage. (Skogerboe-Colo St)
W79-02988

SOYBEAN YIELDS AND LANCE NEMATODE POPULATIONS AS AFFECTED BY SUBSOILING, FERTILITY, AND NEMATICIDE TREATMENTS,
Agricultural Research Service, Tifton, GA. Coastal Plain Station.
M. B. Parker, N. A. Minton, O. L. Brooks, and C. E. Perry.
Argonomy Journal, Vol. 67, No. 5, p 663-666, September-October 1975. 1 fig, 5 tab, 13 ref.

Descriptors: *Soybeans, Crop response, *Nematodes, Fertilization, Nematicides, Soil compaction, *Crop production.

Soil compaction, Nematode damage, and fertility problems occurring singly and in combination appear to be responsible for low yields of soybeans in some Coastal Plain soils. This study was designed to determine if these conditions could be corrected with certain fertility treatments, subsoiling, and a nematicide. Results indicate the importance of the nematicide, 1,2-dibromo-3-chloropropane, and subsoiling for soybean production on compacted soils infested with lance nematodes. (Skogerboe-Colo St)
W79-02989

THE RECOVERY OF LEAF WATER POTENTIAL, TRANSPIRATION, AND PHOTOSYNTHESIS OF COTTON DURING IRRIGATION CYCLES,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2D.
W79-02990

EFFECT OF IRRIGATION, LIME, AND FERTILITY TREATMENTS ON THE YIELD AND CHEMICAL COMPOSITION OF SOYBEANS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
J. A. Lutz, Jr., and G. D. Jones.
Agronomy Journal, Vol. 67, No. 4, p 523-526, July-August 1975. 6 tab, 5 ref.

Descriptors: *Soybeans, *Crop response, *Nutrients, *Fertilization, Potassium, Phosphorus, Irrigation, Irrigation effects, *Lime, *Micronutrients.

Data are available on the effects of surface applied plant nutrients on the yield, quality, oil, and protein contents of soybean seed and on the chemical composition of the soybean leaves. Very little information is available, however, on the effects of irrigation and plow sole (30.5 cm) placement of plant nutrients on these same plant characteristics. In order to determine the effects of irrigation and plow sole placement of P, K, lime, and micronutrients on the quality, yield, oil, and protein contents of soybean seeds and on the chemical composition of the leaves, a field experiment was conducted for 3 consecutive years. Soybean seed yields were increased each year with irrigation. Yields were unaffected by P and K treatments during the first 2 years, but in the thirty year, yields were lower where P and K had not been applied on the plow sole. Lime and micronutrients did not significantly affect yield. Irrigation increased the oil content but did not effect the protein content. Leaf P and K concentration were unaffected by irrigation but were affected by P and K applications. (Skogeboe-Colo St)
W79-02991

EFFECT OF IRRIGATION AND NITROGEN ON THE DRY MATTER AND CRUDE PROTEIN YIELDS OF 'PANGOLA' DIGITGRASS,
University of the West Indies, St. Augustine (Trinidad). Dept. of Soil Science.
L. Byam, and F. A. Gumbs.
Agronomy Journal, Vol. 67, No. 3, p 365-369, May-June 1975. 6 tab, 14 ref.

Descriptors: *Grasses, *Forage grasses, Irrigation effects, Irrigation, Crop response, Crop production, *Dry farming, Dry seasons, Fertilizers, *Fertilization, *Nitrogen, Loam, Sands, *Pangola digitgrass.

In Trinidad, West Indies, a dairy industry is being developed on Piarco fine sand/fine sandy loam soil. The soil is physically and chemically poor. The cattle obtain most of their food supply by grazing 'Pangola' digitgrass. There is an urgent need to increase grass production on this soil type. Inadequate water supply in the dry season limits grass production. Previous fertilizer trials with Pangola digitgrass on this soil type have indicated that N fertilizer is likely to give better yield response than P, K, or Ca. This trial was therefore conducted to determine the irrigation-N management for wet and dry season production of Pangola digitgrass on this soil at adequate levels of P and K. (Skogerboe-Colo St)
W79-02992

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A PROCEDURE TO DETERMINE DIRECT DIVERSIONS FROM LAKE MICHIGAN,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 3D.
W79-02523

CALIFORNIA'S PROGRAM FOR DEALING WITH THE DROUGHT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6E.
W79-02544

SURFACE WATER FLOODING IN URBAN AREAS: RIGHTS AND REMEDIES UNDER THE COMMON ENEMY DOCTRINE,
For primary bibliographic entry see Field 6E.
W79-02552

THE DEVELOPMENT OF FLOOD-POTENTIAL INDEX MAPS FOR PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, D. F. Kibler, and C. J. Tagliati.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 391, Price codes: A06 in paper copy, A01 in microfiche.

Institute for Research on Land and Water Resources Research, Penn State Univ., Project Technical Completion Report, Dec 1978. 98 p, 19 fig, 11 tab, 23 ref, 3 append. OWRT A-049-PA(1), 14-34-0001-8040.

Descriptors: *Flood peak, *Flooding, *Pennsylvania, Urbanization, *Maps, *Population density, *Streamflow regulation, *Flood indices, *Flood potential, Index maps, Gaged watersheds, Ungaged watersheds, Return period.

Flood-potential index maps were developed for Pennsylvania. Flood indices were computed for gaged watersheds by dividing the 100-year and the 2.33-year flood peaks by the watershed area contributing to flooding. It was found that Q2.33 is proportional to A0.8 and Q100 is proportional to A0.7. Flood indices were plotted on maps broken down into three area ranges and two return periods. A procedure was developed using the flood-potential index maps to estimate peak floods for ungaged watersheds. The square of the inverse distance to nearby flood index location is used as a weighting factor. The flood index is estimated for the 100-year and the 2.33-year return period and the corresponding flood peaks are computed. A nomograph is provided to obtain flood peaks for return periods between 2.33- and the 100-year periods. The effect of streamflow regulation on flood peaks was studied. Various approaches to correct flood indices for streamflow regulation were tried. A preliminary study of the effect of urbanization on flood peaks was also made. Population density was used as a parameter in the correction of flood indices. (Sink-Penn State)
W79-02598

UNSTEADY STREAMFLOW SIMULATION USING A LINEAR IMPLICIT FINITE-DIFFERENCE MODEL,
Geological Survey, NSTL Station, MS. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02644

IMPACT OF FLOW REGULATION AND POWER PLANT EFFLUENTS ON THE FLOW AND TEMPERATURE REGIMES OF THE CHATTAHOCHEE RIVER -- ATLANTA TO WHITESBURG, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02648

METHODS FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN ARIZONA,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02649

A RAINFALL-RUNOFF MODELING PROCEDURE FOR IMPROVING ESTIMATES OF T-YEAR (ANNUAL) FLOODS FOR SMALL DRAINAGE BASINS,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02652

TRANSIT LOSSES AND TRAVELTIMES OF RESERVOIR RELEASES ALONG THE ARKANSAS RIVER FROM PUEBLO RESERVOIR TO JOHN MARTIN RESERVOIR, SOUTHEASTERN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
R. K. Livingston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 129, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-75, September 1978. 30 p, 8 fig, 8 tab, 14 ref.

Descriptors: *Water management(Applied), *Reservoir operation, *Reservoir releases, *Streamflow, *Flow control, Computer models, Streamflow forecasting, Diversion, Water loss, Surface-groundwater relationships, Aquifer characteristics, Channel morphology, Hydrologic data, Time of travel, *Colorado, *Arkansas River reservoirs(Colo).

The volumes of reservoir releases are decreased or delayed during transit by bank storage, channel storage, and evaporation. Results from a computer model, calibrated by a controlled test release from Pueblo Reservoir, Colo., indicate that transit losses are greatest for small releases of a short duration when made during periods of low Antecedent streamflow. For equivalent releases, transit losses during the winter are about 7 percent less than losses during the summer. Based on available streamflow records, the velocity of reservoir releases ranges from about 0.6 miles per hour at the downstream end of the study reach, when antecedent streamflow is 10 cubic feet per second, to about 6.8 miles per hour at the upstream end of the study reach, when antecedent streamflow is 3,000 cubic feet per second. Consequently, the traveltime of a release increases as antecedent streamflow diminishes. Management practices that may be used to benefit water users in the study area include selection of the optimum time, rate, and duration of a reservoir release to minimize the transit losses, determination of an accurate traveltime, and diversion at several incremental rates. (Woodard-USGS)
W79-02659

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02665

WATER RESOURCES DATA FOR ARKANSAS, WATER YEAR 1977.
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02666

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City. OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02667

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1977.
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02668

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE,
Matrecon, Inc., Oakland, CA.
For primary bibliographic entry see Field 8G.
W79-02704

ASSESSMENT AND IMPLEMENTATION OF IN-STREAM VALUE STUDIES FOR THE NORTHERN GREAT PLAINS,
Montana Univ., Missoula. Dept. of Geology.
A. J. Silverman, and L. Parrish.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 272, Price codes: A08 in paper copy, A01 in microfiche. Second Annual Report, Prepared for Environmental Protection Agency, 1974. 35 fig, 42 tab, 53 ref, 3 append, 1 plate. EPA-68-01-2653.

Descriptors: *Montana, *Stream flow, *Sediment transport, *Fish types, *Aquatic environment, *Bathymetry, *Ice cover, Low flow, Velocity, Aquatic insects, Aquatic life, Mapping, Montana, *Tongue River(Mont).

The objective of this study included the implementation of a methodology for the recommendation of minimum streamflow on a medium sized river containing a warm water fish community; an evaluation of the suitability of the methodology; and an evaluation of flow criteria, including nonbiotic factors, used in making the flow recommendation. Flow criteria for the recommendation of minimum streamflows were established using the stonecat as an indicator species. Fish distribution as related to major habitat areas, instream flow needs, and proposed coal development were examined as were the in-stream requirements of the benthic macroinvertebrates. The Tongue River in Montana was used for the study. (Lardner-ISWS)
W79-02709

LAKE PROCESS MODELS APPLIED TO RESERVOIR MANAGEMENT,
URS Corp., San Mateo, CA.
For primary bibliographic entry see Field 5A.
W79-02716

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer District, Vicksburg, MS.
R. I. Kaufman.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. WR1, p 105-121, November 1978. 4 fig, 1 tab, 4 ref.

Descriptors: *Flood control, *Levees, *Mississippi River, Seepage, Waves(Water), Drainage, Basins, Planning, Projects, Hydrologic data, Floods, Design, Government agencies.

In 1973, a major flood occurred on the Mississippi River. Much of the alluvial valley of the river between Alton, Ill. and the Gulf of Mexico is protected against floods by Federally constructed flood control works. As some of these systems were not complete at the onset of the flood, a major flood fight was required to safeguard the valley. Many miles of levee had to be raised to provide proper protection. Other problems requiring flood-fight efforts were seepage under levees, scour at levees and structures, and riverbank failures. Even though major emergency efforts were required, the Federal flood control systems were effective and of great value in controlling the flood. The projects prevented the inundation of 26,000 sq miles (67,500 km2) of land and reduced flood damages by over $14,000,000,000. However, the losses sustained indicate the need to complete authorized works and possibly expand existing projects or initiate new projects in some areas, or both. (Bell-Cornell)
W79-02717

SURFACE WATER RESOURCES OF NORTHWEST FLORIDA,
Johnson (Bernard), Inc., Houston, TX.
For primary bibliographic entry see Field 2E.
W79-02727

VALUES AND CHOICES IN THE DEVELOPMENT OF THE COLORADO RIVER BASIN.
American Association for the Advancement of Science, Washington, DC. Committee on Arid Lands.
For primary bibliographic entry see Field 6B.
W79-02732

PHYSICAL SETTING, (COLORADO RIVER BASIN),
California State Water Resources Control Board, Sacramento.
W. D. Maughan.
In: Values and Choices in the Development of the Colorado River Basin, ed by D F Peterson and A. B. Crawford, p 9-17, 1978. University of Arizona Press, Tucson. 1 fig, 9 ref

Descriptors: *River basin development, *Colorado River basin, *Saline water, *Water quality, Water utilization, Comprehensive planning, Regional development, Water management(Applied).

The climate of this great river basin, draining nearly a quarter of a million square miles, from Wyoming to Mexico, is arid to semiarid, with precipitation ranging from more than 50 inches in the higher northern mountains drown to less than 4 inches in the southern desert. The geology of the basin accounts for its tremendous salt deposits, many of which are exposed to erosion or to contact with percolating waters, thus contributing to the salt load of the river itself. It is now generally acknowledge that for all practical purposes the water supply of the river is completely depleted, since only minor quantities of essentially unusable water reach the Guld of California. While the basin has been effectively converted into an immense continental resource for man's use, increasing attention to the consequences of this use is now being paid. Unless great care is taken, the salinity problem will be amplified by actions associated with untapping the great energy resources of the upper basin, especially if mass development of oil shale and coal reserves occurs. Any long range solution to the problems of the Colorado River Basin lies outside the control of any one of the several states through which it flows, and basin-wide planning must be initiated by one means or another. (See also W79-02732) (Paylore-Arizona).
W79-02733

COLORADO RIVER DEVELOPMENT, (COLORADO RIVER BASIN),
Upper Colorado River Commission, Salt Lake City, UT.
For primary bibliographic entry see Field 6E.
W79-02734

POLITICS OF WATER ALLOCATION, (COLORADO RIVER BASIN),
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6E.
W79-02735

ENERGY RESOURCES DEVELOPMENT, (COLORADO RIVER BASIN),
Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 3E.
W79-02737

THE ROLE OF AGRICULTURE, (COLORADO RIVER BASIN),
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 3F.
W79-02738

COMMUNITY DEVELOPMENT, (COLORADO RIVER BASIN),
California Univ., Santa Barbara.
For primary bibliographic entry see Field 6B.
W79-02740

CARRYING CAPACITY AND PLANNING, (COLORADO RIVER BASIN),
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W79-02741

STUDIES ON THE ECOLOGY OF A STREAMSIDE FOREST: COMPOSITION AND DISTRIBUTION OF VEGETATION BENEATH THE TREE CANOPY,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
For primary bibliographic entry see Field 2I.
W79-02752

DEVELOPING PROCEDURES FOR PREDICTING EFFECTIVENESS IN SEEPAGE CONTROL,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
G. R. Dutt, and D. G. Boyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 429, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Center, University of Arizona Project Completion Report, 1978, 8 p. OWRT A-035-ARIZ(3), 14-31-0001-3803.

Descriptors: Soils, Seepage, Reservoirs, *Seepage control, *Soil water movement, *Forecasting, *Arizona, *Hydraulic conductivity, Alkaline soils, Soil texture, Sodium adsorption ratios, Sealing(Ponds).

Permeameter experiments were performed on six Arizona soils using a solution of 12.5 meq/l and varied sodium concentrations. Hydraulic conductivities for five soils were reduced 60 to 95 percent for input solutions having maximum sodium adsorption ratios (SAR) to 25. Effective soil sealing occurred even though the soils were alkaline. Sealing with sodium appears nearly irreversible at low solution concentrations and saturated conditions. The soil having the highest initial hydraulic conductivity recovered less than 20 percent of the original conductivity upon reapplication of a calcium solution. These results are useful when considering sealing small ponds by sodium application. Hydraulic conductivity changes from increases in solution SAR were described mathematically using two empirically determined parameters that appear unique for each soil at a constant concentration. The parameters found for this study, plus those found from data of previous studies, were compared using multiple regression analysis to determine the most significant soil properties in predicting conductivity changes. Soil texture has the greatest influence on the parameters. An equation derived by combining data from eleven alkaline soils was selected as best for predicting hydraulic conductivities resulting from SAR changes. Predictions should be improved if additional soil data were available for analysis.
W79-02820

AN ECONOMIC ANALYSIS OF ALTERNATIVE FEDERAL FLOOD DAMAGE ASSISTANCE PROGRAMS.
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 6F.
W79-02824

EFFECTS OF WATER DRAWDOWN ON THE FAUNA IN SMALL COLD-WATER RESERVOIRS,
Colorado Univ., Ft. Collins.
M. E. McAfee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 391, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, Fall 1976. 70 p, 13 fig, 8 tab, 71 ref, append. OWRT B-132-COLO(1), 14-34-0001-6062.

Descriptors: Recreation, High country reservoir, Water management(Applied), Fishery quality, *Reservoir drawdown, *Reservoir operation, *Reservoir releases, Drawdown, Flow control, Reservoir management, Primary productivity, *Fisheries management, Invertebrates, *Colorado.

Four small, cold-water reservoirs were studied to determine the effect of drawdown on their fauna. Two of the reservoirs, Idaho Springs and Urad, had stable (non-fluctuating) water levels and two, Comanche and Eaton, were completely drawn down. Observations of reservoir and drainage basin characteristics and drawdown patterns were made, and primary productivity, invertebrate abundance, and abundance and condition of fish in the reservoir were measured. No conclusive evidence of drawdown was found. The primary productivity values were very low and varied only slightly between the reservoirs. Invertebrate densities were relatively high in Idaho Springs, a stable reservoir, and in Comanche, a drawdown reservoir. Invertebrate densities were somewhat lower in Urad and Eaton. Fish densities were also higher in Idaho Springs and Comanche than in the other two reservoirs. Coefficients of condition for game fish were somewhat higher in Urad, a stable reservoir, and Eaton, a drawdown reservoir. A possible reason for these results and their implications for management are discussed.
W79-02830

POLLUTION FORECAST IN STREAMS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-02831

HOST SPECIFICITY OF CERCOSPORA RODMANII, A POTENTIAL BIOLOGICAL CONTROL OF WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
K. E. Conway, and T. E. Freeman.
Plant Disease Reporter, Vol. 61, No. 4, p 262-266, April, 1977. 1 tab, 14 ref. OWRT A-033-FLA(2), 14-34-0001-7020.

Descriptors: *Biocontrol, *Plant pathogens, *Water hyacinth, Aquatic weeds, *Aquatic fungi, *Cercospora rodmanii.

The host specificity of the fungus Cercospora rodmanii, a pathogen of water-hyacinth (Eichhornia crassipes), was determined. The susceptibility of 85 selected plants (58 species, some with several cultivars tested) of economic and ecological importance, representing 22 families, were evaluated by both greenhouses and field test. A modified centrifugal (related plants) and varietal (economic plants) strategy was utilized in the selection of the plants to be tested. The results showed that C. rodmanii is a pathogen of waterhyacinth with a limited host range. Therefore its usage as a biological control for waterhyacinth would not be expected to create problems either for plants grown commercially or for plants considered of ecological importance in Florida. (Morgan-Fla)
W79-02884

WATER CONSERVATION INFORMATION DISSEMINATION DURING THE 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W79-02904

INVESTIGATION OF NATURAL SEALING PROCESSES IN IRRIGATION CANALS AND RESERVOIRS,
Idaho Univ., Moscow.
E. Brockway.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 491, Price codes: A07 in paper copy, A01 in microfiche. PhD Dissertation March 1977. 126 p, 33 fig, 17 tab, 61 ref, 2 append. OWRT A-023-IDA(2).

Descriptors: *Seepage water, *Canals, Hydraulics, *Reservoirs, *Surface sealing, Water loss, *Sealing, Sediment transport, *Hydraulic conductivity, *Seepage control.

Laboratory and field studies of physical, organic, and chemical factors affecting the variations in seepage rates due to natural processes in canals and reservoirs under prolonged submergence were performed. Effective reduction of hydraulic conductivity due to sediment migration in three sand sizes with three sediment sizes was examined in laboratory columns. Sediment migration measured nondestructively by gamma ray scanning was compared with corresponding changes in hydraulic conductivity. A simplified equation relating the deposit ratio, or volume of sediment retained at any point in the column to the hydraulic conductivity was developed. Procedures for estimating changes in hydraulic conductivity of Portneuf silt-loam soils of southern Idaho due to soil-water-chemical effects were developed.
W79-02905

Group 4A—Control Of Water On The Surface

MULTIOBJECTIVE TRADE-OFF RISKS IN RESERVOIR OPERATION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and K. N. Raja Rao.
Preprint 2863. Paper presented at the American Society of Civil Engineers Spring Convention and Exhibit. Dallas, Texas, April 25-29, 1977. 26p, 4 fig, 5 tab, 14 ref. OWRT A-054-IA(3), 14-34-0001-6016.

Descriptors: *Management, *Multiple objective, Trade-offs, *Planning, *Reservoir operation, *Optimization, Flood control, Recreational facilities, Sedimentation, Systems engineering, Water resources.

Noncommensurate, human factor multiobjectives that are subjectively discerned and evaluated now may be included in reservoir operation determinations through trade-off techniques. Objectives are related in terms of real trade-offs with constrained optimizations and a priori estimates of objective worth are eliminated. By repeating the constrained optimizations for many synthetic realizations of inputs, it is possible to evaluate the risk or confidence associated with each trade-off level (and associated operation policy). Bases on the subjective trade-off choices and associated reliabilities, trade-off levels for reservoir operation may be selected. The optimum operation rule is then derived (for those trade-off levels) using implicit stochastic optimization techniques already available and may be tested and modified in comprehensive reservoir models. The techniques are applied to the practical problem of the Coralville reservoir, near Iowa City, Iowa for flood control and recreation objectives in a sedimenting reservoir.
W79-02915

GRAVITY-FLOW IRRIGATION AND THE SPREAD OF AQUATIC WEEDS IN SUDAN,
Gezira Univ., Wad Medani (Sudan). Dept. of Biological Sciences.
M. E. Beshir.
Environmental Conservation, Vol. 5, No. 2, p. 143-146, Summer, 1978. 2 tab, 5 ref.

Descriptors: *Irrigation systems, *Aquatic plants, *Canals, *Artificial lakes, Agriculture, Irrigation, Wetlands, Ponds, Sudan, Ponding, Rainfall, River systems.

The distribution of rainfall in Sudan is highly seasonal in character. The country is dependent upon its river system for perennial irrigation for reliable agricultural production. At present about 4.6 million acres (1.9 million ha) are under irrigated agriculture. In these areas, irrigation is achieved by a gravity-flow method based on hydraulic principles which take maximum advantage of land contours. It consists of hierarchies of supply and distributive canals. The lower stages of these hierarchies, called Minor-canals, produce ponding conditions and are very favorable for extensive growth of aquatic macrophytes. Mechanical methods using rakes and chains operated by hand have been used to combat weed infestations. These methods will become unfeasible and ineffective as the present plan of irrigated agricultural development in Sudan will mean a corresponding increase in Minor-canals and extended man-made aquatic habitats. (Howard-Mass)
W79-02930

ASSESSMENT OF THE PHYSICAL AND BIOLOGICAL CHARACTERISTICS OF THE MAJOR LAKE CHAMPLAIN WETLANDS,
State Univ. of New York Coll. at Plattsburgh.
For primary bibliographic entry see Field 2H.
W79-02937

BIOLOGICAL FOUNDATIONS OF FOREST DRAINAGE EFFICIENCY,
Akademiya Nauk SSSR, Moscow. Lab. of Forest Sciences.
For primary bibliographic entry see Field 2I.
W79-02951

A PRELIMINARY CLASSIFICATION OF WETLAND PLANT COMMUNITIES IN NORTH-CENTRAL MINNESOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center
For primary bibliographic entry see Field 2I.
W79-02956

4B. Groundwater Management

THE CONTAMINATION OF GROUNDWATER BY HEAVY METALS FROM THE LAND DISPOSAL OF FLY ASH,
Notre Dame Univ., IN. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-02507

SUBSIDENCE OF LAND CAUSED BY WITHDRAWAL OF PERCOLATING WATER IS ACTIONABLE ON THE THEORIES OF NEGLIGENCE AND NUISANCE IN FACT,
For primary bibliographic entry see Field 6E.
W79-02550

ESTABLISHING LIABILITY FOR DAMAGE RESULTING FROM THE USE OF UNDERGROUND PERCOLATING WATER: SOUTH-SOUTHWEST INDUSTRIES V. FRIENDSWOOD DEVELOPMENT COMPANY,
For primary bibliographic entry see Field 6E.
W79-02555

ANALYSIS OF GRAVITY DATA FROM THE PICACHO BASIN, PINAL COUNTY, ARIZONA,
Arizna Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 7C.
W79-02599

WATER WELLS AND SPRINGS IN PALO VERDE VALLEY, RIVERSIDE AND IMPERIAL COUNTIES, CALIFORNIA,
Geological Survey, Laguna Niguel, Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02647

GROUNDWATER IN THE NEWBERG AREA, NORTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02650

LINEAR GROUND-WATER FLOW, FLOOD-WAVE RESPONSE PROGRAM FOR PROGRAMMABLE CALCULATORS,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02651

EFFECTS OF BOTTOM SEDIMENTS ON INFILRATION FROM THE MIAMI AND TRIBUTARY CANALS TO THE BISCAYNE AQUIFER, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02653

PRELIMINARY EVALUATION OF THE WATER-SUPPLY POTENTIAL OF THE SPRING-RIVER SYSTEM IN WEEKI WACHEE AREA AND THE LOWER WITHLACOOCHEE RIVER, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. C. Sinclair.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 074, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-74, June 1978. 40 p, 13 fig, 4 tab, 24 ref.

Descriptors: *Potential water supply, *Springs, *Streams, *Surface-groundwater relationships, *Saline water intrusion, Hydrogeology, Water supply, Aquifers, Potentiometric level, Flow nets, Diversion, Saline water-freshwater interface, Evaluation, Projections, *Florida, *Gulf coast, Citrus County(Fla), Hernando County(Fla).

Coastal springs and seeps, including Rainbow Springs, a tributary of Withlacoochee River, discharge as much as a billion gallons of water per day to low-lying coastal swamps and estuarine marshes along the Guld Coast of Citrus and Hernando Counties, Florida. Although Weeki Wachee Spring has long been regarded as an obvious source of freshwater supply, long-term diversion of large volumes of water from Weeki Wachee River will cause encroachment of brackish water throughout the residential canals in the lower reach of the river to about 4.4 miles below Weeki Wachee Spring. Weeki Wachee Spring is analogous to a flowering well tapping an artesian aquifer. Flow characteristics of Withlacoochee River and Rainbow Springs indicate that about 600 cubic feet per second is available on a perennial basis, disregarding the downstream requirements for control of saltwater encroachment. (Woodard-USGS)
W79-02655

PRELIMINARY APPRAISAL OF THE GEOHYDROLOGIC ASPECTS OF DRAINAGE WELLS, ORLANDO AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. O. Kimrey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 136, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 78-37, May 1978. 24 p, 8 fig, 1 tab, 8 ref.

Descriptors: *Groundwater recharge, *Hydrogeology, *Drainage wells, *Aquifer characteristics, *Water quality, Aquifer management, *Florida, *Orlando area(Fla), *Floridan aquifer.

The Floridan aquifer contains two highly transmissive cavernous zones in the Orlando area: an upper producing zone about 150-600 feet below land surface and a lower producing zone about 1,100-1,500 feet below land surface. Natural head differences are downward and there is hydraulic connection between the two producing zones. Drainage wells are finished open-end into the upper producing zone and emplace surface waters directly into that zone by gravity. Quantitatively, their use constitutes an effective method of artificial recharge. Their negative aspects relate to the probably poor, but unknown, quality of the recharge water. Caution is suggested in drawing definite and final conclusions on the overall geohydrologic and environmental effects of drainage wells prior to the collection and interpretation of a considerable quantity of new data. Though few ground-water pollution problems have been documented, the potential for pollution should be seriously considered in light of the probable continuing need to use drainage wells; the probable volumes and quality of water involved; and the hydraulic relations between the two producing zones. (Woodard-USGS)
W79-02656

ESTIMATED AGRICULTURAL GROUNDWATER PUMPAGE IN PARTS OF FRESNO, KINGS, AND MADERA COUNTIES, SAN JOAQUIN VALLEY, CALIFORNIA, 1974-77,
Geological Survey, Menlo Park, CA. Water Resources Div.
H. T. Mitten
Available from OFSS, Box 25425, Denver, CO 80225; microfiche, $3.50; paper copy, $25. Open-file report 78-826, September 1978. 3 p, 1 fig, 1 tab.

Descriptors: *Groundwater, *Pumping, *Water utilization, *Irrigation, Withdrawal, Estimating, Electricity, Electric motors, *California, *San Joaquin Valley(Calif), Groundwater pumpage.

Agricultural ground-water pumpage data are presented for 1974-77 for the area on the west side of the San Joaquin Valley in parts of Fresno, Kings, and Madera Counties, Calif., which has approximately the boundaries of the Westlands Water District. The method of estimating pumpage was based on electric-power consumption at the agricultual wells. (Woodard-USGS)
W79-02658

FEASIBILITY OF WATER-SUPPLY DEVELOPMENT FROM THE UNCONFINED AQUIFER IN CHARLOTTE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
R. M. Wolansky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 220, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-26, April 1978. 34 p, 13 fig, 3 tab.

Descriptors: *Groundwater resources, *Water resources development, *Water supply, *Hydrogeology, *Water quality, Evaluation, Aquifer characteristics, Groundwater movement, Transmissivity, Groundwater recharge, Shallow wells, Water yield, Water table, *Florida, Charlotte County(Fla).

The unconfined aquifer in Charlotte County contains some potable water over most of the county, and represents a potential source of water supply to help satisfy the increasing demands of development. An estimated 150 billion cubic feet of relatively good quality water is stored in the unconfined aquifer. Transmissivity of this aquifer averages about 500 square feet per day, ranging from 100 to 7000 feet per day. Although recharge is primarily from rainfall, a significant amount occurs by upward movement of water from underlying confined aquifers through abandoned and flowing irrigation wells. Average annual recharge is estimated at 12 inches per year, and ranges from less than one inch to 16 inches per year. Chemical quality of the water is variable. However, chloride concentrations of water from the unconfined aquifer generally are less than 50 milligrams per liter. The area of greatest potential yield is located east of Telegraph Swamp in eastern Charlotte County. (Woodard-USGS)
W79-02662

DISTRIBUTION OF DISSOLVED NITRATE AND FLUORIDE IN GROUND WATER, HIGHLAND-EAST HIGHLANDS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02663

PRELIMINARY HYDROLOGIC BUDGET OF THE SAND-AND-GRAVEL AQUIFER UNDER UNSTRESSED CONDITIONS, WITH A SECTION ON WATER-QUALITY MONITORING, PENSACOLA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02664

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02665

WATER RESOURCES DATA FOR ARKANSAS, WATER YEAR 1977.
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02666

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City. OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02667

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1977.
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02668

N15/N14 RATIOS OF GROUND-WATER NITRATE, LONG ISLAND, NEW YORK,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5B.
W79-02689

LAS VEGAS VALLEY WATER BUDGET: RELATIONSHIP OF DISTRIBUTION, CONSUMPTIVE USE, AND RECHARGE TO SHALLOW GROUNDWATER,
Nevada Univ. System, Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 5G.
W79-02728

NICOMEKL-SERPENTINE BASIN STUDY, BRITISH COLUMBIA,
Department of Fisheries and Environment, Vancouver (British Columbia). Water Resources Branch.
E. C. Halstead.
Scientific Series No. 94, 1978, 36 p, 24 fig, 3 maps, 9 ref, 4 tab.

Descriptors: *Artesian wells, *Watersheds(Basins), *Groundwater, *Irrigation, *Movement, Methodology, Investigations, Climatology, Hydrology, Geology, Chlorides, Chemical analysis, Stratigraphy, Bedrock, Glaciology, *Canada, *Nicomekl-Serpentine drainage basin(B C), *British Columbia.

The Nicomekl-Serpentine drainage basin covers an area of 322 sq. km. (124 sq mi) of which 57 sq km (22 sq mi) are lowlands below elevations of 1 m (3 ft). The lowlands occupy a former embayment of the sea that is filled with more than 300 m (1000 ft) of unconsolidated Quaternary deposits. All of the wells drilled within the lowlands are flowing artesian, but the geology does not indicate a classical artesian basin. The groundwater movement within the drainage basin has been defined using geochemistry. Local flow systems that occur in the upland areas become integrated into major flow systems, the discharge end of which occupies the lowlands. The high total dissolved solids and hydrochemistry of the groundwater within the lowlands suggest that groundwater movement is controlled in part by (1) flow reversals caused by semidiurnal tidal fluctuations; (2) decreased permeabilities owing to facies changes inherent in the sediments that were deposited in a fluvial, glaciofluvial and glaciomarine environment; and (3) flow restrictions caused by the confluence of regional flow systems. Since a relatively high NaCl concentration is characteristic of the quality of much of the groundwater, a map showing isochlors, or lines of equal chloride concentrations, is included in this report as well as a classification using sodium criteria as a guide to illustrate the suitability of the groundwater for irrigation. (WATDOC)
W79-02785

USE OF NEUTRON ACTIVATABLE TRACERS FOR SIMULATING WATER AND CHEMICAL FLOW THROUGH POROUS MEDIA,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5B.
W79-02814

INTERACTION BETWEEN LANDFILL LEACHATES AND CARBONATE-DERIVED RESIDUAL SOILS,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-02829

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT MODEL FOR THE ANALYSIS OF CONTAMINANT TRANSPORT IN VARIABLY SATURATED POROUS MEDIA, USER'S GUIDE,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W79-02838

UNCERTAINTIES OF KARSTIC WATER RESOURCES SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W79-02883

THE EFFECT OF ORGANIC CARBON ON THE CONCENTRATIONS OF IRON AND HYDROGEN SULFIDE IN GROUND WATER,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W79-02908

WELL FIELD SITE SELECTION BASED ON GEOLOGIC CRITERIA THAT INFLUENCE GROUND WATER CIRCULATION IN THE VICINITY OF LARAMIE, WYOMING,
Wyoming Univ., Laramie. Water Resources Research Inst.
D. A. Lundy, and P. W. Huntoon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 546, Price codes: A07 in paper copy, A01 in microfiche. Project Completion Report, September 1978. 76 p, 19 fig, 9 tab, 23 ref, 4 append. OWRT A-024-WYO(1), 14-34-0001-7108,8054.

Descriptors: *Groundwater, Hydraulics, *Wyoming, Groundwater movement, Geohydrology, Potable water, Dissolved solids, Calcium, Magnesium, Bicarbonates, *Sites(Water wells), *Casper aquifer(Wyo), Laramie(Wyo).

The Casper aquifer is defined as the saturated part of the Casper and Fountain formations in the vicinity of Laramie, Wyoming. Faults provide lateral and vertical zones of large transmissivity, and are hydraulic drains that collect westward-flowing ground water and shunt it to springs near the Casper-Satanka contact. Recharge to the aquifer over a 79 sq. mi. intake area is estimated to be 1.4 inches/year. The Casper aquifer contains potable water that has a total dissolved solids range of 139 to 285 milligrams/liter. The chemical character of Casper water is calcium-bicarbonate in elevated parts of the recharge area but becomes a calcium-magnesium-bicarbonate water down-grandient.
W79-02912

AN APPRAISAL OF THE HYDROGEOLOGICAL PROCESSES INVOLVED IN SHALLOW SUBSURFACE RADIOACTIVE WASTE MANAGEMENT IN CANADIAN TERRAIN,
Department of Fisheries and Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5B.
W79-02926

DUG-WELLS, DUG-CUM-BORE WELLS, AND TUBEWELLS,

Central Groundwater Board, Nagpur (India).
P. G. Adyalkar.
Indian Farming, p 13-16, March, 1975.

Descriptors: *Dug wells, *Water wells, *Water supply, *Shallow wells, *Water yield, Water sources, Groundwater, Groundwater mining, Water table, Well data, Permeability, Wells, Hydrogeology, Boreholes, Soil texture, Recharge, Soil types, Aquifers, Surveys, Water resources, Dug-cum-bore wells, *Tubewells, *India.

For optimum potential, dug wells should have a large diameter, adequate water column, high permeability and low hydraulic gradient. In non-arid regions their depth is limited to 60 m, and in Maharashtra and Madhya Pradesh in India, the dug-wells are generally limited to 20 m. A water column of about 5 m in the lean part of the year should be adequate. There is good reason to put a bore in an existing well (dug-cum-bore wells) when: (1) the formation tapped in the open well is fine-grained or poor in productivity, and there is a good chance of encountering a coarse-grained or productive formation below a depth of 15 m; (2) the formation tapped in the open well is limited in depth but underlain by an effective confining bed followed in depth by a good confined aquifer; or (3) the potential productive water table zone is tapped fully in the existing due well by improvement in respect to increased depth, diameter and water column. A tubewell taps a potential confined aquifer below a confining layer and therefore effectiveness of the tubewell will depend upon the effectiveness of the confining bed. (Robinett-Arizona)
W79-02994

DEVELOPMENT OF CAVITY TYPE TUBEWELLS,
Indian Inst. of Tech., Kharagpur.
For primary bibliographic entry see Field 8B.
W79-03000

4C. Effects On Water Of Man's Non-Water Activities

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF NUTRIENTS, A RAINFALL SIMULATION STUDY,
Iowa Natural Resources Council, Des Moines.
S. G. Barisas, J. L. Baker, H. P. Johnson, and J. M. Laflen.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 5, p 893-897, September-October 1978. 6 fig, 1 tab, 23 ref.

Descriptors: *Soil erosion, *Runoff, *Nutrients, *Farm management, Soil conservation, Crops, Corn, Mulching, Rainfall, Simulated rainfall, Soils, Soil types, Sediments, Phosphorus, Nitrogen, Nitrates, Ammonia, Phosphates, Water pollution, Agriculture, *Tillage practices, Residue cover.

The objective of this study was to evaluate the effects of different tillage practices on the loss of N and P in runoff and sediment from experimental plots using simulated rainfall. Twelve plots on each of 3 different Iowa soils were planted to corn, and 6 tillage practices were used. Simulated rainfall was applied to the plots, and surface runoff samples were collected. The water fraction of the runoff was analyzed for NO3-N, NH4-N, and PO4-P; the sediment was analyzed for total nitrogen and available phosphorus. At all sites, the available P content of the eroded soil increased with residue cover; however, decreased soil loss with increased residue cover offset the higher available P content of the eroded soil. Loss of total N with sediment was inversely related to the percentage of soil covered with residue. Losses of NO3-N, NH4-N, and PO4-P with water were small as compared with N and P losses with sediment. Soluble nutrient concentrations were positively correlated with the amounts of soil surface covered with residue. Conservation tillage practices are ineffective in reducing the loss of water soluble nutrients; however, they did reduce total nutrient loss by controlling erosion. (Sims-ISWS)
W79-02680

SPATIAL CHANGES IN WATERFOWL HABITAT,
Canadian Wildlife Service, Ottawa (Ontario).
For primary bibliographic entry see Field 2H.
W79-02742

HISTORICAL LAND USE CHANGES AND IMPACTS IN LAKE CHAMPLAIN WETLANDS (1941/42, 1962, 1974),
New England River Basins Commission, Burlington VT. Lake Champlain Basin Study.
E. Barber, D. J. Bogucki, G. K. Gruendling, and M. Madden.
June, 1977. 80 p, 3 tab, 5 ref, 2 append.

Descriptors: *Wetlands, *Land use, *History, *Lake Champlain, Marshes, Lakes, Land development, Marsh management, Agriculture.

Historical trends in land use change and impacts were analyzed from the early 1940's through 1974 for land both in and adjacent to 12 selected or priority Lake Champlain areas. This has changed little except for a slight tendency towards abandonment of cultivated areas since 1939-42. Only a few places have been developed residentially or industrially to any extent, and these are all located in close proximity to urban areas. Wetlands with gentle slopes from the terrestrial to the wetland environment (primarily deltaic and bayhead) are apparently much more subject to man-related pressures. In addition, these wetlands are more prone to be state conservation agencies' sites of habitat modification for waterfowl management and recreational complexes. (Steiner-Mass)
W79-02750

ECOSYSTEMS OF THE WORLD 1: WET COASTAL ECOSYSTEMS.
For primary bibliographic entry see Field 2L.
W79-02762

SOCIAL IMPACTS FROM WILDLIFE WITHIN THE COLUMBIA BASIN IRRIGATION DISTRICT,
Washington State Univ., Pullman. Dept. of Forest and Range Management.
For primary bibliographic entry see Field 6B.
W79-02839

4D. Watershed Protection

EVALUATION OF MEASURES FOR CONTROLLING SEDIMENT AND NUTRIENT LOSSES FROM IRRIGATED AREAS,
Idaho Agricultural Experiment Station, Moscow.
For primary bibliographic entry see Field 5G.
W79-02501

AN OVERVIEW OF NUTRIENT CYCLING RESEARCH AT COWEETA HYDROLOGIC LABORATORY,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
C. D. Monk, D. A. Crossley, Jr., R. L. Todd, W. T. Swank, and J. B. Waide.
In: Watershed Research in Eastern North America: A workshop to compare results, February 28-March 3, 1977, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, Smithsonian Institute, Tidemark Printing, Inc., Edgewater, Vol. I, p. 35-50. 1977 1 fig, 1 tab, 36 ref.

Descriptors: *Cycling nutrients, *Water budget silviculture, *Productivity, Coniferous forest, Deciduous forest, *Southern Appalachian Mountains region, *North Carolina.

A research program at the Coweeta Hydrologic Laboratory, North Carolina, is investigating effects of perturbation or manipulations on nutrient cycling and productivity of forested watersheds. The experimental approach is to explain whole ecosystem behavior, as revealed by watershed nutrient and water budgets, by reference to internal ecosystem processes. Research is designed to examine the emergence of higher level ecosystem properties from lower level component processes. This report describes the general scope of the research at process levels and relates dynamics of internal processes to ecosystem level response. The research is organized around a general theory of ecosystem relative stability, based on the complementary aspects of resistance to disturbance and resilience following disturbance. The research is a cooperative effort between the U. S. Forest Service and the University of Georgia. (Forest Service)
W79-02571

FOREST SERVICE STUDIES OF SOIL AND NUTRIENT LOSSES CAUSED BY ROADS, LOGGING, MECHANICAL SITE PREPARATION, AND PRESCRIBED BURNING IN THE SOUTHEAST,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W79-02572

SIMULATION OF POTENTIAL EFFECTS OF FOREST UTILIZATION ON THE NITROGEN CYCLE IN DIFFERENT SOUTHEASTERN ECOSYSTEMS,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
J. B. Waide, and W. T. Swank.
In: Watershed Research in Eastern North America: A workshop to compare results, February 28-March 3, 1977, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, Smithsonian Institute, Tidemark Printing, Inc., Edgewater, Vol. I, p. 767-789. 1977 5 fig, 2 tab, 19 ref.

Descriptors: *Nitrogen cycle, *Productivity silviculture, Forest practices, Coniferous trees, Deciduous trees, Southeastern ecosystems.

Research at the Coweeta Hydrologic Laboratory is examining effects of management practices on elemental cycles in forested watersheds. Forest harvesting methods may alter both quality of streamwater draining forested lands (the off-site response) and sustainable productivity of forest being managed (the on-site response). Results from Coweeta suggest that long-term changes in water-quality are not likely to result from current management practices, but effects on sustainable yield are unknown. Simulation models of nitrogen cycling were used to assess potential effects of several management alternatives on sustainable productivity and elemental cycling. Responses of nitrogen dynamics in oak-hickory and loblolly pine forest to simulated merchantable-stem and complte-tree harvests with several rotation lengths were examined. Results suggest that some management practices may lead to long-term alterations of nitrogen cycling and productivity, and that conclusions from such simulation studies will depend on how elemental cycling models are conceptualized. Discussions emphasize the importance of evaluating land-management alternatives in the context of current knowledge of forest elemental cycling processes. (Forest Service)
W79-02573

NUTRIENT BUDGETS FOR UNDISTURBED AND MANIPULATED HARDWOOD FOREST ECOSYSTEMS IN THE MOUNTAINS OF NORTH CAROLINA,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
W. T. Swank, and J. E. Douglass.
In: Watershed Research in Eastern North America: A workshop to compare results, Feb 28-Mar 3, 1977, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, Smithsonian Institute, Tidemark Printing, Inc., Edgewater, Vol. I, p 343-363. 1977 2 fig, 7 tab, 16 ref.

Descriptors: *Forestry practices, *Water quality, Chemical properties, *Cycling nutrients, Silviculture, Coniferous forest, Deciduous forest, *Southern Appalachian Mountains, *North Carolina.

Stream chemistry was monitored for 8 mature hardwood ecosystems and 16 forested systems that were altered by cutting, species conversions, and changes in land use. Net budgets (input minus output) of NO3-N, NH4-N, PO4-P, Cl-, K+, Na+, Ca++, Mg++, SO4=, and SiO2 were estimated for 15 ecosystems based on dissolved ion concentrations and the quantity of precipitation and streamflow. None of the manipulations produced long-term nutrient discharges that would adversely affect water quality for municipal or fishery use. Of the nutrients studied, NO3-N provided the most sensitive index of ecosystem disturbance. When the forests were cut and in various stages of revegetation, elevated NO3-N discharge was observed at least 13 years after cutting, but appeared to return to baseline levels 20 years after treatment. No changes in the discharge of NH4-N and PO4-P were observed for any of the watersheds; all ecosystems showed very large accumulations of SO4=. A grass-to-forest succession watershed that had been fertilized, limed, and herbicided showed large nutrient losses. Conversion of deciduous forests to eastern white pine reduced the loss of most nutrients, and net budgets of young coppice forests indicated nutrient cycles that wer as closed or tight as mature hardwood forests. Results demonstrate the importance of both hydrologic and biologic processes in evaluating ecosystem response. (Forest Service)
W79-02574

PREIMPOUNDMENT STUDY LITTLE BLACK CREEK DRAINAGE BASN BLACK CREEK WATERSHED BULLOCH COUNTY, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W79-02635

TRANSPORT OF AGRICULTURAL CHEMICALS FROM SMALL UPLAND PIEDMONT WATERSHEDS,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5B.
W79-02745

A MULTIOBJECTIVE APPROACH TO MANAGING A SOUTHERN ARIZONA WATERSHED,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
A. Goicoechea, L. Duckstein, and M. Fogel.
In: Hydrology and Water Resources in Arizona and the Southwest. Proceedings of the 1976 Meetings of American Water Resources Assn. and Arizona Academy of Sciences, Tucson, Arizona, April 29-May 1 1976, p 233-242 (1976). OWRT B-043-ARIZ(10), 14-31-0001-5056.

Descriptors: Decision making, Natural resources, *Arizona, *Watershed management, *San Pedro River watershed(Ariz), Mathematical programming, *Multiobjective management.

The case study of an Upper San Pedro River watershed is developed to show how a multiple objective approach to decision-making may be used in watershed management. The effects of various land treatments and management practices on water runoff, sediment, recreation, wildlife levels, and commercial potential of a study area are investigated while observing constraints on available land and capital. The example involves the optimization of five objective functions subject to eighteen constraints. In an iterative manner, the decision-maker proceeds from one noninferior solution to another, comparing sets of land management activities for reaching specified goals, and evaluating trade-offs between individual objective functions. This technique, which involves the formulation of a surrogate objective function and the use of the cutting plane method to solve the general nonlinear problem, hopefully provides a compromise between oversimplified and computationally intractable approaches to multiobjective watershed management.
W79-02881

5. WATER QUALITY MANAGEMENT AND PROTECTION

MICROBIAL DEGRADATION OF PESTICIDES,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
M. Alexander.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-047 675, Price codes: A08 in paper copy, A01 in microfiche. Office of Naval Research, Department of the Navy, Contract Numbers N00014-76-C-0019, N00014-67-A-0077-0027, 159 p, 1977. 29 fig, 38 tab, 142 ref.

Descriptors: *DDT, *Microbial degradation, *Bacteria, *Fungi, *Metabolism, Biodegradation, *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Pesticides, Chemical reactions, Pesticide kinetics, DDD, DDE, Organophosphorus pesticides, Chemical analysis, Enzymes, Organic compounds, Aquatic algae.

Microbial degradation of various organochlorine, organophosphorus and carbamate pesticides by aquatic and soil microorganisms was studied. Bacteria, fungi, and an alga (Cylindrospermum sp.) metabolized DDT to water-soluble products. 1,1-dichloro-2,2-bis(P-chlorophenyl)ethane, 1,1-dichloro-2,2-bis(P-chlorophenyl)ethylene, DDD, DDE, DDM, DBH, DBP and PCPA were detected. The degradation of DDT metabolites yielded: DDM, DBH and DBP from DDA; DBH and DBP from DDM; and DBH from DBP. DDT and its breakdown products had no significant effect on respiration of microbial communities or algal productivity. The biodegradability of DDT analogs was related to their chemical structure. Studies of resting-cell suspensions and cell-free enzyme extracts of two organophosphate-and one carbamate-utilizing bacteria indicated that both constitutive and induced broad, substrate-specific enzymes were responsible for organophosphate and carbamate metabolism. The metabolites of various organophosphates were: dimethyl and diethyl phosphate and thiophosphate, indicating hydrolytic attack on the parent compound by phosphatases. (EIS-Deal)
W79-02583

5A. Identification Of Pollutants

EVALUATION OF THE MC-300A SOIL MOISTURE METER TO DETERMINE IN-PLACE MOISTURE CONTENT OF REFUSE AT LAND DISPOSAL SITES,
Environmental Protection Agency, Cincinnati, OH. Solid Waste Management Office.
R. J. Wigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 359, Price codes: A02 in paper copy, A01 in microfiche. Progress Report No. SWR-91, 1971. 24 p, 2 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Soil moisture meter, *Landfills, *Degradation, *Moisture content, Solid waste disposal, Waste dumps, Liquid wastes, Sludge, Solid wastes, Moisture meters, Laboratory tests, Testing procedures, Wastes, Municipal wastes.

Preliminary results of a laboratory investigation of the portable soil moisture meter, MC-300A, to determine the in-place moisture content of refuse at land disposal sites are presented. Several samples of fresh and composted refuse with varying moisture contents were prepared, moisture probes were inserted into the samples, meter readings were obtained, and calibration curves were drawn relating the moisture content to the meter readings. The discrepancies noted during the investigation indicated that the instrument was less accurate than first assumed, so that its usefulness is limited to noting changes in moisture rather than specific changes in moisture content. This instrument could be useful for studying movement of moisture fronts, but not for the correlation of moisture content and gas production or temperature. The instrument is further limited by the changing moisture properties due to decomposition, and data obtained should be considered qualitative rather than quantitative. (Davison-IPA)
W79-02503

DETECTION OF WATER POLLUTANTS BY LASER EXCITED RESONANCE RAMAN SPECTROSCOPY; PESTICIDES AND FUNGICIDES,
Rhode Island Univ., Kingston. Dept. of Chemistry.
R. J. Thibeau, L. Van Haverbeke, and C. W. Brown.
Rhode Island University Marine Reprint No. 100. Reprinted from: Applied Spectroscopy, Vol 32, No 1, p 98-100, 1978. 4 fig, 1 tab, 8 ref. SG-04-6-158-44002.

Descriptors: *Pollutant identification, *Pesticides, *Fungicides, *Spectroscopy, Water pollution, Pesticide residues, Pollutant detection.

The feasibility of resonance Raman spectroscopy in the detection of hazardous chemicals in water has been tested on some nitrophenol-based pesticides and fungicides. In most cases, detection limits below the parts per million level were obtained. The method was also tested on an artifically polluted river water sample. (NOAA)
W79-02576

INVESTIGATION OF ISOTHIOCYANATOPENTAAQUOCHROMIUM (III) AS A REAGENT FOR THE SEPARATION AND IDENTIFICATION OF NANOGRAM QUANTITIES OF MERCURY (I), MERCURY (II), AND METHYLMERCURY (II),
North Dakota Univ., Grand Forks. Dept. of Chemistry.
R. J. Baltisberger, and C. L. Knudson.
Analytical Chemistry, Vol. 47, No. 8, p 1402-1406, July 1975, 1 fig, 5 tab, 22 ref. OWRT B-020-NDAK(3), 14-31-0001-3922.

Descriptors: Analytical techniques, Water analysis, *Mercury, Separation techniques, *Pollutant identification, *Methylmercury, Isothiocyanatopentaaquochromium(III), Mercury complexes, Identification, Separation of mercury species.

The reagent, isothiocyanatopentaaquochromium (III) (CrNCS2+), forms polynuclear species with CH3Hg+, Hg2+, and Hg22+ with the stoichiometry (CrNCS)nMex+ where n equals 1 or 2. An ion exchange procedure was investigated for the separation of nanogram quantities of Me equal to Ch3Hg+, Hg22+, and Hg2+ in water based on the formation of the (CrNCS)nMe complex ions. The three mercury species can be isolated by variation of the eluent acidity. Possible analytical applications for samples containing down to 20 nanograms of mercury are discussed.
W79-02589

A BIOMONITORING PROCEDURE UTILIZING NEGATIVE PHOTOAXIS OF FIRST INSTAR AEDES AEGYPTI LARVAE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
D. E. Simonet, W. I. Knausenberger, L. H. Townsend, Jr., and E. C. Turner, Jr.
Archives of Environmental Contamination and Toxicology, Vol. 7, p 339-347, 1978. 3 fig, 2 tab, 33 ref. OWRT A-042-VA(3).

Descriptors: *Toxicity, *Water quality monitoring, Heavy metals, Pesticides, Mosquitoes, *Monitoring, Larvae, Aquatic insects, Toxicity tests, Pollutant identification, *Biomonitoring, Phototaxis, Water pollution control.

Group 5A—Identification Of Pollutants

This research addresses the need for an assessment of field conditions and in-plant effluent toxicity in water-quality management efforts. It develops a sensitive, easily performed test which does not require elaborate facilities or great expense of time or money. It evaluates the toxic effect of selected heavy metals and insecticides on mosquito larvae (Aedes aegypti) by using inhibition of swimming ability to indicate poisoning of the central nervous system. The research describes a photomigration procedure, which differs from standard acute mortality tests, and uses an inexpensive multi-unit apparatus consisting of four glass troughs perpendicular to a uniform light source. Inhibition of larval ability to swim away from light was used as the parameter for determining toxicity. The toxicants tested were the heavy metals copper, cadmium, and hexavalent chromium; and the pesticides carbofuran, methomyl, fenitrothion, fonofos, and phosmet. Results showed that, of the metals, cadmium was most toxic, followed by copper and then chromium. Of the insecticides evaluated, fenitrothion, fonofos, and phosmet were most toxic. The procedure described represents a sensitive means of assessing water quality rapidly and economically.
W79-02593

EFFECT OF MERCURY ON NADH AND THE PROTECTIVE ROLE OF OXALACETATE,
Georgia Univ., Athens. Dept. of Food Science.
For primary bibliographic entry see Field 5D.
W79-02596

CATHODIC STRIPPING METHODS FOR THE DETERMINATION OF PHOSPHATE AND ARSENATE IN NATURAL WATERS,
Southern Illinois Univ. at Carbondale.
C. Kuo-hsien.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 382, Price codes: A08 in paper copy, A01 in microfiche. PhD Dissertation, December 1977. 137 p, 37 fig, 10 tab, 83 ref. OWRT A-087-ILL(5), and S-033-ILL(1).

Descriptors: Chemical analysis, Electrochemistry, *Phosphates, *Water analysis, *Arsenate, Ion selective membranes, Trace analysis(Inorganic), Pollutant identification, *Cathodic stripping method.

The oxidation of Fe(II) at a carbon electrode in the presence of phosphate and/or arsenate results in a film of Fe(III) salts of those anions on the electrode surface. Accumulation of the film under controlled conditions occurs in direct proportion to the concentrations of those anions. Subsequent electrochemical reduction of the salt film provides a current which can readily be related to the orignial solution concentration. In this manner phosphate and arsenate can be determined down to 10 micrograms per liter (ppb). Natural water contains several species which can interfere with this method. Hence, a simple pretreatment method which utilizes Donnan dialysis (transfer through an anion exchange membrane) was developed for studies on such samples. The resulting approach, Donnan dialysis followed by electrochemical stripping analysis, provides statistically identical results to those obtained by use of standard methods for the determination of phosphate and arsenate in water and wastewater. Test samples included lake water, river water, and sewage effluent from several sources. The method is more rapid, more sensitive, and less subject to interference.
W79-02602

EXPERIMENTS WITH LITTORINA SPECIES TO DETERMINE THE RELEVANCY OF OIL SPILL DATA FROM SOUTHERN CALIFORNIA TO THE GULF OF ALASKA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W79-02621

DESIGN AND EVALUATION OF LABORATORY ECOLOGICAL SYSTEM STUDIES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W79-02625

FEASIBILITY OF USING BACTERIAL STRAINS (MUTAGENESIS) TO TEST FOR ENVIRONMENTAL CARCINOGENS,
Houston Univ., TX. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02626

TECHNIQUES FOR SAMPLING AND ANALYZING THE MARINE MACROBENTHOS,
Corvallis Environmental Research Lab., OR.
R. C. Swartz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 631, Price codes: A03 in paper copy, A01 in microfiche. Report EOA-600/3-78-030, 34 p, March 1978. 2 tab, 18 ref.

Descriptors: *Sampling, *Analytical techniques, *Biological communities, *Benthic fauna, Mathematical studies, Aquatic populations, Data collections, On-site data collections, Monitoring, Testing procedures, Bottom sampling, Water analysis, Chemical analysis, Biomass, *Methodology, *Species diversity, *Tissue analysis.

This report presents guidelines for the quantitative assessment of the effects of marine pollution on benthic community structure and population dynamics. The sampling design addresses the number and location of stations, survey frequency, sampling gear, replication of samples, screening and preservation of biological samples, and the collection of abiotic data. Recommendations are given for the sorting, identification, enumeration, and weighing of benthic specimens. The section on data analysis suggests indices for detecting changes in species composition, density, dispersion, diversity, richness, dominance, spatial-temporal faunal homogeneity. (EIS-Deal)
W79-02627

DETERMINATION OF ALKYLMERCURY COMPOUNDS IN LAKE SEDIMENTS BY STEAM DISTILLATION-FLAMELESS ATOMIC ABSORPTION,
Purdue Univ., Lafayette. Dept. of Agronomy.
M. Floyd, and L. E. Sommers.
Analytical Letters Vol 8 No 8, p. 525-535, 1975. 3 tab, 10 ref. OWRT A-023-IND(3).

Descriptors: *Mercury, *Lake sediments, Water pollution, Gas chromatography, *Pollutant identification, *Alkymercury compounds, Methylmercury, Dimethylmercury, Steam distillation, Atomic absOrption.

Organic mercury compounds in lake sediments were separated into dialkyl- and monoalkylmercury fractions by steam distillation and subsequently quantified by flameless atomic absorption. The method recovered nearly all CH3HgCh3 and Ch3HgCl added to diverse sediments. Parameters influencing the efficacy of the procedure, i.e., Hg concentration, sample size and distillation time, were evaluated.
W79-02642

USE OF COMMENSAL PROTOZOA AS BIOLOGICAL INDICATORS OF WATER QUALITY AND POLLUTION,
Wayne State Univ., Detroit, MI. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02643

GROUNDWATER IN THE NEWBERG AREA, NORTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02650

BACTERIOLOGICAL WATER QUALITY OF TULPEHOCKEN CREEK BASIN, BERKS AND LEBANON COUNTIES, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02654

DISTRIBUTION OF DISSOLVED NITRATE AND FLUORIDE IN GROUND WATER, HIGHLAND-EAST HIGHLANDS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02663

PRELIMINARY HYDROLOGIC BUDGET OF THE SAND-AND-GRAVEL AQUIFER UNDER UNSTRESSED CONDITIONS, WITH A SECTION ON WATER-QUALITY MONITORING, PENSACOLA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02664

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02665

WATER RESOURCES DATA FOR ARKANSAS, WATER YEAR 1977.
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02666

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02667

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1977.
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02668

VOLATILE CHLORO- AND BROMOCARBONS IN COASTAL WATERS,
Maryland Univ., College Park, Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W79-02684

A DEVICE TO COLLECT SUPERNATANT WATER FROM MEASUREMENT OF THE FLUX OF DISSOLVED COMPOUNDS ACROSS SEDIMENT SURFACES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.; and Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
B. T. Hargrave, and G. F. Connolly.
Limnology and Oceanography, Vol. 23, No. 5, p 1005-1010, September 1978. 4 fig, 1 tab, 14 ref

Descriptors: *Sampling, *Water chemistry, *Instrumentation, *Equipment, Sediments, Dissolved oxygen, Carbon dioxide, Phosphorus, Bottom sediments, Chemical analysis, Analytical techniques, Data processing, Supernatant water, Sediment surfaces

A bell jar chamber with a clock-driven release mechanism was designed to collect samples of water trapped over undisturbed sediments. Samples taken at 3-h intervals over 24 h were analyzed for dissolved oxygen, carbon dioxide, and total phosphorus, and in situ flux across the subtidal sediment surface was calculated. (Sims-ISWS)
W79-02686

TRACE METALS IN THE WATERS OF A PARTIALLY MIXED ESTUARY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2K.
W79-02687

N15/N14 RATIOS OF GROUND-WATER NITRATE, LONG ISLAND, NEW YORK,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5B.
W79-02689

LAKE PROCESS MODELS APPLIED TO RESERVOIR MANAGEMENT,
URS Corp., San Mateo, CA.
W. L. Bradford, and D. J. Maiero.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No. EE5, p 981-996, October 1978. 3 fig, 8 tab, 22 ref.

Descriptors: *Lakes, *Reservoirs, *Management, *New York, *New Jersey, *Pennsylvania, *Trophic level, *Model studies, Eutrophication, Loading, Impoundment, Phosphorus, Predictions, Dissolved oxygen, Mesotrophy, Equations, Simulation analysis, Systems analysis.

Two simplified models of lake processes have been used to predict the trophic state of the proposed Tocks Island Lake to be constructed on the Delaware River, north of Trenton, New Jersey. Using independent estimates of phosphorus entering the lake area via the river, both models predicted that the lake would be eutrophic with hypolimnetic dissolved oxygen demands exceeding 5 mg/l and midsummer Secchi Disk transparency depths as low as 0.6 m. Point source phosphorus loads to the basin were estimated from known wastewater discharges, and nonpoint loads from known land uses and area loading factors. Then proposed measures to reduce the phosphorus load were tested for effectiveness by calculating the proportional decrease in load brought about by each measure and applying the proportion to the phosphorus load entering the lake area. The new load was then used with the models to predict the new trophic state. It was found that very stringent controls would be required to bring a significant change in the trophic state toward mesotrophy. (Bell-Cornell)
W79-02716

NON-POINT SOURCE WATER QUALITY MONITORING, INYO NATIONAL FOREST, 1975,
California Univ., Los Angeles. Environmental Science and Engineering.
A Progress Report, Contribution No. 156, California Water Resources Center, University of California, Davis, March 1976. 138 p, 69 fig, 82 ref, append. Bass, J., Westerdahl, F.D., and Perrine, R.L., Eds.

Descriptors: *Water quality, *Monitoring, *National forests, *California, *Non-point sources, Recreation areas, Wilderness areas, Evaluation, Sampling, Natural environment, Human use, Physical measurements, Chemical analyses, Bacteriological observations.

Presented are the results of a study focused on the impact of non-point sources on water quality in wilderness and recreational areas within the Inyo National Forest in California. One objective was to asses water quality with regard to physical, chemical and bacteriological parameters in a manner permitting evaluation of area-wide sources. A second objective, as an ongoing part of the Center's studies, was to develop improved test methods for continuing water quality monitoring and protection in such areas. Concern was given to increasing understanding of relationships between water quality, the natural environment and human use. The principal effort in these studies involved a monitoring program in which 34 sites selected by the U.S. Forest Service were sampled one or more times during the summer and fall, 1975. (Most sites can be characterized as high altitude, alpine lakes of small to moderate size, or streams, snow-fed from granite basins). All sites represented areas frequented by recreational visitors, and were sampled with their use as a primary concern. Physical measurements included air and water temperature, dissolved oxygen, pH, and total dissolved solids. Chemical analysis included tests for sulfates, nitrate-nitrogen, Kjeldahl nitrogen, chloride, phosphates, total phosphorus and methylene blue active substances. Bacteriological observations included total and fecal coliform organisms and Yersinia enterocolitica. Additional sampling concerned algae in a portion of the lakes studied. A separate research effort by means of laboratory-scale experimental investigation looked into the means of transport of bacteria from sites at which they might be deposited to a nearby water body. (Bell-Cornell)
W79-02718

ENVIRONMENTAL PARAMETERS OF THE TENNESSEE RIVER IN ALABAMA: II. PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS,
Alabama Univ., in Huntsville. School of Graduate Studies and Research.
L. M. Rosing.
UAH Research Report No. 173, June 1976. 283 p, 163 fig, 16 tab, 17 ref, 3 append. NASA NAS8-30772.

Descriptors: *Alabama, *Tennessee River, *Water quality, *Sampling, *On-site investigations, Data processing, Chemical properties, Biological properties, Physical properties, Chemicals, Hardness(Water), Metal, Water temperature, Fish, Turtles, Benthic fauna, Pollutants, Monitoring, Rivers, Water pollution.

Physical, chemical, and biological data from 5 sites in the Tennessee River, 2 in Guntersville Reservoir and 3 in Wheeler Reservoir, Alabama, were correlated with climatological data for 3 annual cycles. Two of the annual cycles were for the years prior to the Browns Ferry Nuclear Power Plant operations, and one was for the first 14 months of Plant operations. A comparison of the results of the annual cycles indicated two distinct physical conditions in the reservoirs, one during the warm months when the reservoirs are at capacity and one during the colder winter months when the reservoirs have been drawndown for water storage during the rainy months and for weed control. The wide variations of physical and chemical parameters to which the biological organisms are subjected on an annual basis control the biological organisms and their population levels. Comparison of the parameters of the site below the powerplant indicated that the heated effluent from the plant operating with 2 of the 3 reactors has not had any effect on the organisms at this site. Recommendations included the development of prediction math models for the physical and chemical parameters under specific climatological conditions which affect biological organisms. Recommendations also included continuing the weekly sampling at the Wheeler and Browns Ferry site to determine the long-range effect of the Browns Ferry Nuclear Power Plant. (Sims-ISWS)
W79-02781

DETOXIFICATION OF METALS BY MARINE BIVALVES: AN ULTRASTRUCTURAL STUDY OF THE COMPARTMENTATION OF COPPER AND ZINC IN THE OYSTER OSTREA EDULIS,
Institute of Marine Biochemistry, Aberdeen (Scotland).
S. G. George, B. J. S. Pirie, A. R. Cheyne, T. L. Coombs, and P. T. Grant.
Marine Biology, Vol. 45, p 147-156, 1978. 3 fig, 4 tab, 25 ref.

Descriptors: *Metals, *Copper, *Zinc, *Oysters, *Toxicity, *Electron microscopy, *Biological membranes, *Enzymes, *Animal metabolism, Cytological studies, Path of pollutants, Mollusks, Pathology, Animal physiology, *Detoxification, Vesicles, *Tissue analysis, *Bioaccumulation.

An investigation of the mechanisms of detoxification of copper and zinc by the oyster has been carried out using naturally occurring 'green-sick' (contaminated by copper) and unpolluted oysters. Electron microprobe x-ray analysis of tissues in the electron microscope gives direct evidence for the structural compartmentation of copper and zinc in separate, specific, granular amoebocytes. The metals are immobilized in membrane-limited vesicles as different chemical compounds, copper being associated with sulphur and zinc with phosphorus. Chemical analysis of serum and tissues of normal and 'green-sick' oysters indicate that (1) Cu and Zn are accumulated independently, (2) the Cu and Zn in the serum, while higher than in the surrounding sea water, are maintained at a 10-fold smaller level than the tissues, (3) toxicity is reduced by active uptake from the serum into granular amoebocytes, where it is further reduced by compartmentation in membrane-limited vesicles. It is calculated that the individual cell types may contain as much as 13,000 ppm Cu and 25,000 ppm Zn. (EIS-Deal)
W79-02784

APPLICABILITY OF EXISTING METHODS FOR THE DETERMINATION OF THE BIOCHEMICAL OXYGEN DEMAND (BOD) OF INCINERATOR QUENCH WATER,
Bureau of Solid Waste Management, Cincinnati, OH.
D. L. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 946, Price codes: A03 in paper copy, A01 in microfiche. 1970. 41 p, 4 fig, 9 tab, 11 ref, 1 append. EPA-RS-03-68-18.

Descriptors: *Water pollution, *Biochemical oxygen demand, *Water analysis, *Dissolved oxygen analyzers, Laboratory equipment, Sampling, Measurement, Liquid wastes, Incinerators, Water pollution sources, Pollutant identification, Bioindicators, Bioassay, Microorganisms, Winkler test, Quenching, Analytical techniques, Alsterberg(Azide), Modifications, Cooling water.

An investigation of the Alsterberg (Azide) modification of the Winkler (Dissolved Oxygen) method and the Weston and Stack (DO) Analyzer, model 300-B, to assess their applicability in determining the Biochemical Oxygen Demand (BOD) of incinerator quench water is discussed. The interfering substances found were many of the same ones found in samples of lakes, rivers, streams, sewage and industrial waste waters, but they were in lower concentrations. It was found that quench water samples had BOD values ranging from 100 to 300 ppm on a 5-day basis. These samples required a dilution factor to 2.5%, and it is suggested that the analyst use more samples to reduce possible errors in the BOD result. Modification of existing methods was unnecessary, but immediate DO analysis or the seeding technique are not recommended. It is concluded that properly interpreted BOD measurements can serve as an index to water quality. The Alsterberg (Azide) modification of the Winkler method was unsatisfactory for determining BOD measurements on the samples of quench water that were tested. The Weston and Stack Do Analyzer, model 300-B, analyzed the BOD content of the quench water samples successfully. A detailed method for the application of this instrument was written, which includes a newly developed procedure for an easy, fast field calibration check on a properly calibrated DO analyzer. Qualitative tests to determine the applicability of the modified Wenkler method on field samples are included. (Davison-IPA)
W79-02788

EVALUATION OF PROPOSED NPDES LIMITATIONS FOR HOMESTAKE MINING COMPANY AND LEAD-DEADWOOD SANITARY DISTRICT NO. 1.
National Inforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5G.
W79-02790

TASTE AND ODOR, MISSOURI RIVER, IOWA TRIBUTARIES AREA, IOWA-NEBRASKA, 1970.
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5G.
W79-02811

DENITRIFICATION IN A MASSACHUSETTS SALT MARSH,
Boston Univ., MA. Dept. of Biology.
W. Kaplan.
PhD Dissertation, 1977. 78 p.

Descriptors: *Salt marshes, *Massachusetts, *Denitrification, Wetlands, Coastal marshes, Tidal marshes, Marsh plants, Aquatic bacteria, Cyanophyta, Nitrates, Ammonia, Nitrogen cycle, Groundwater.

The rate of gaseous nitrogen flux from salt marsh sediments during denitrification was studied using fertilized plots. In all plots, rates of denitrification increased 2 to 3 fold during the summer. There was also fertilized-induced increases in denitrification, particularly in sediments of low marsh Spartina alterniflora. Rates of denitrification ranged from 1.5 g N/sq m/year for control plots to 3.8 g N/sq m/year for fertilized plots. Rates of denitrification in various habitats of the marsh (tidal creek bottoms, panes, high marsh) also increased during the summer months. The most striking increases occurred between sediments of creek bank and high marsh S. alterniflora. Groundwater discharge from surrounding fresh water springs contained high concentrations of nitrate and could be a major source of oxidized nitrogen compounds used in denitrification. The total annual amount of N lost during denitrification was equal to the annual NO3(-) and NO2(-)-N input by groundwater. The potential of marsh sediments to generate nitrate during the oxidation of NH4(+) to NO3(-) was quite high, but these rates will only be realized at depths where oxygen is able to diffuse into the mud from Spartina roots. Under most circumstances, nitrate was rapidly removed from these anoxic sediments. (Steiner-Mass)
W79-02812

ANALYSIS AND CHARACTERIZATION OF TRACE ELEMENTS IN SHALE OIL PRODUCTS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS,
Missouri Univ.-Columbia. Dept. of Chemistry.
P. Shaw.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 421, Price codes: A06 in paper copy, A01 in microfiche. MA Thesis, December 1978. 109 p, 12 fig, 21 tab, 71 ref. OWRT A-106-MO(1), 14-34-0001-8027.

Descriptors: *Instrumental neutron activation analysis, *Trace elements, *Shale oil products, *Oil shale, Water pollution, Heavy metals, Arsenic, *Pollutant identification, Missouri, Green River(MO), Aluminum, Antimony, Bromine, Cerium, Chlorine, Chromium, Cobalt, Copper, Gallium, Gold, Iodine, Iron, Manganese, Mercury, Molybdenum, Potassium, Selenium, Sodium, Sulfur, Tungsten, Vanadium, Zinc.

Trace elements and their mobilization constitute an important consideration in the development of new fossil fuel technologies. Shale oil produced by in situ retorting of soil shale is an alternative fossil energy source. This study deals with the analysis of trace elements in various shale oil products using instrumental neutron activation analysis (INAA). INAA offers several advantages for those elements for which it is applicable. The greatest advantage is the lack of sample preparation prior to analysis, which greatly simplifies the process and prevents sample contamination. The elements for which analyses are reported in this study are aluminum, antomony, arsenic, bromine, cerium, chlorine, chromium, cobalt, copper, gallium, gold, iodine, iron, manganese, mercury, molybdenum, potassium, selenium, sodium, sulfur, tungsten, vanadium, and zinc.
W79-02822

INTERACTION BETWEEN LANDFILL LEACHATES AND CARBONATE-DERIVED RESIDUAL SOILS,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-02829

LONG-TERM ASPECTS OF THE ENVIRONMENTAL BURDEN FROM ENERGY PRODUCTION: CO2 AND 3H, (IN GERMAN),
Kernforschungsanlage Juelich G.m.b.H. (West Germany). Programmgruppe Systemforschung und Technologische Entwicklung.
F. Niehaus.
Report Jul-1165, February 1975. 171 p, 69 fig, 12 tab, 149 ref.

Descriptors: *Powerplants, *Air pollution, *Pollutants, *Water cycle, Carbon dioxide, Tritium, Water pollution, Water pollution sources, Model studies, Mathematical models, Electric power, Electric power industry, Electric powerplants, Thermal powerplants, Nuclear powerplants, Energy, Foreign research, Atmosphere, Fossil powerplants.

The subjects of this study were the carbon dioxide and tritium emissions from fossil or nuclear power plants. The analysis of possible effects of alternative strategies to meet future energy demand on the temperature of the atmosphere depends on the mathematical model of the global carbon dioxide cycle whih uses nonlinear differential equations. As there have to be substitutions of fossil power plants by nuclear facilities, another model was constructed to simulate the water cycle of the northern and southern hemispheres. The model makes it possible to compute the effects of tritium emissions in the future. (Sims-ISWS)
W79-02855

USE OF HISTOLOGIC AND HISTOCHEMICAL ASSESSMENTS IN THE PROGNOSIS OF THE EFFECTS OF AQUATIC POLLUTANTS,
Louisville Univ., KY. School of Medicine.
For primary bibliographic entry see Field 5C.
W79-02877

TRACE METALS IN SOME FISH SPECIES OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
A. K. Koli, S. S. Sandhu, W. T. Canty, K. L. Flex, and R. J. Reed.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 328-331, 1978. 1 tab, 5 ref.

Descriptors: *Metals, *Fish physiology, Animal metabolism, *Copper, *Iron, *Zinc, Manganese, *Cadmium, *Mercury, Brown trout, Shrimp, White bass, Catfishes, Freshwater fish, Marine fish, Fish behavior, *Tissue analysis.

Samples of fish from freshwater and saltwater sources of ocean, rivers, and lakes over the state of South Carolina were collected. The fish collected were Shrimp, Silver Snapper, White Bass, Catfish, Mudfish, and Trout. Triplicate samples of fish muscle tissue were analyzed by wet digestion and dry digestion methods. A significant finding of this report is that saltwater fish have more trace metal levels than freshwater fish, and larger fish have higher trace metal levels than smaller fish. Iron and zinc levels were much higher in Shrimp than any other species analyzed. (EIS-Deal)
W79-02887

CADMIUM AND ZINC CONTENT OF FISH FROM AN INDUSTRIALLY CONTAMINATED LAKE,
Purdue Univ., Lafayette. IN. Dept. of Bionucleonics.
B. R. Murphy, G. J. Atchison, A. W. MacIntosh, and D. J. Kolar.
Journal of Fish Biology, Vol. 13, p 327-335, 1978. 2 fig, 3 tab, 27 ref.

Descriptors: *Cadmium, *Zinc, *Sunfishes, *Bass, Industrial wastes, Metals, Fish physiology, Animal metabolism, Chemical wastes, Fish populations, Lakes, Effluents, Path of pollutants, Trophic levels, Size, Spectrophotometry, Chemical analysis, Indiana, *Bioaccumulation, *Tissue analysis, Palestine Lake.

Eleven species of fish from an industrially-contaminated lake were analyzed for whole body cadmium and zinc content by atomic absorption spectrophotometry. Cadmium and zinc content of fish were species related, and most species accumulated these trace metals to levels significantly higher than background. Cadmium content was much more variable than zinc content. Distributions of concentrations of both cadmium and zinc in fish were lognormal, and concentrations of both metals tended to decrease in higher trophic levels. Zinc concentrations significantly decreased as total length increased in three species. (EIS-Deal)
W79-02888

RAPID METHOD FOR DETERMINING CONCENTRATIONS OF BAYER 73 IN WATER DURING LAMPRICIDE TREATMENTS,
Fish and Wildlife Service, La Crosse, WI. Fish Control Labs.
V. K. Dawson, P. D. Harman, D. P. Schultz, and J. L. Allen.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1262-1265, 1978. 2 fig, 7 ref.

Descriptors: *Lampreys, *Pesticides, *Chemical analysis, *Pollutant identification, Pesticide residues, Chemical properties, Water analysis, Laboratory tests, Testing procedures, Analytical techniques, Great Lakes, Water chemistry, *Lampricides, Bayer 73, *TFM

Two, simple, rapid, sensitive methods were developed for determining the concentration of the lampricide Bayer 73 in stream water. Bayer 73 was extracted from acidified water samples with chloroform and then hydrolyzed to CNA with either acid or base. The CNA was diazotized with sodium nitrite, and an azo dye was formed with either N-(1-naphthyl) ethylenediamine dihydrochloride (after acid hydrolysis) or 1-naphthol (after base hydrolysis). (EIS-Deal)
W79-02891

CHLORINATED PESTICIDES AND HEAVY METALS IN STREAMS AND LAKES OF NORTHERN MISSISSIPPI WATER,
Rust Coll., Holly Springs, MS.
For primary bibliographic entry see Field 5B.
W79-02900

APPLICATION OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY TO THE STUDY OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS RELEASED BY ALGAE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
S. W. Hixson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 493, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis 74 p, 23 fig, 13 tab, 39 ref. OWRT A-035-TENN(1).

Descriptors: *Chromatography, *Algae, *Phosphates, Analytical techniques, *Dissolved organic phosphorus, *Pollutant identification.

An analytical technique utilizing high performance liquid chromatography (HPLC) for separating the

inositol phosphates was studied. Commercial inositol hexaphosphate (IHP) and inositol monophosphate (IMP) were adequately separated on Aminex A-27 resin with ammonium bicarbonate as the eluent. A breakdown of the organic bound phosphorus to orthophosphate occurred while on the HPLC column. This breakdown procedure could be due to an alkaline hydrolysis process. Chromatograms of solutions initially containing only IHP yielded four peaks which appear to be best ascribed to residual IHP and the intermediate inositol phosphates containing 5, 4, and 2 phosphate groups per molecule. IMP was not an intermediate of IHP hydrolysis on the LC column. Dissolved organic phosphorus compounds released by the culture Chlamydomonas reinhardtii were subjected to preliminary separation on Sephadex G-25. Sephadex G-25 fraction, which was equal to the inositol phosphate elution position, was chromatographed on the HPLC and resulted in only the orthophosphate peak being identified. This HPLC chromatogram showed that a clean-up procedure was needed prior to HPLC separation. Alkaline bromination was chosen since all the non-inositol phosphates would be oxidized. Samples from the culture study were subjected to alkaline bromination and then chromatographed on sephadex G-25 before being placed on the HPLC. The results showed three major peaks which did not match any of the inositol phosphate standards. Alkaline bromination followed by re-chromatographing the Sephadex fractions resulted in one peak at the elution position of IMP, thus providing marginal evidence for the presence of this compound in the culture solution.
W79-02906

CHROMATOGRAPHIC STUDIES OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS RESULTING FROM ALGAL CULTURES,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
C. L. McEntyre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 550, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, August 1976, 125 p, 82 fig, 6 tab, 65 ref, 3 append. OWRT A-035-TENN(2).

Descriptors: *Chromatography, *Algae, *Phosphorus, Compounds, Orthophosphates, *Dissolved organic phosphorus, *Pollutant identification.

Each of the four algae studied released significant amounts of dissolved organic phosphorus (DOP) into the surrounding water. In some instances the amount of DOP exceeds the amount of dissolved inorganic phosphorus (DIP) in the culture system. The DOP produced is a complex mixture of compounds as shown by the number of peaks on some Sephadex profiles and the large number of spots on the thin layer chromatography (TLC) plates of algal samples. The fact that 16 non-DIP peaks appear on the Sephadex profile of this sample, reinforces the conclusion that each peak in a Sephadex profile can be composed of many different compounds. The number of compounds comprising the DOP increases with culture age and then levels off as the culture leaves the log-growth phase and then starts declining in a closed system such as was used in this study. TLC studies of unfractionated algal culture samples indicate that some of the same compounds are released by each of the four algal species. Some of the DOP compounds persist for several weeks in the culture media. These compounds may either by resistant to degradation and/or reutilization by the algae or they may be continually taken up and replaced by further release by the algae. If the first reason is true, the persistent compounds could possibly be metabolic end-products which are relatively refractory. Even if this is so, they may be readily utilizable by other algal species or by bacteria. IMP is one of the compounds which appear to be present in the DOP produced by all four algal species. It also seems to persist in the DOP for several weeks. IHP does not appear to be present in the DOP produced by the four algae at any time during the culture growth periods examined.
W79-02907

THE EFFECT OF ORGANIC CARBON ON THE CONCENTRATIONS OF IRON AND HYDROGEN SULFIDE IN GROUND WATER,
Missouri Univ.-Columbia. Dept. of Geology.
R. N. Stoufer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 555, Price codes: A05 in paper copy, A01 in microfiche. M. A. thesis December 1975. 85 p, 18 fig, 10 tab, 54 ref, append. OWRT B-077-MO(3), 14-31-0001-3608.

Descriptors: Groundwater, *Iron, *Organic carbon, *Sulfides, Microorganisms, *Oxidation-reduction potential, *Missouri, Water supply, Water wells, *Sulfur-reducing bacteria, Ions, Sampling, Dissolved solids, Water pollution.

Twenty water supply wells in northern Missouri were sampled to determine the relationships between dissolved organic carbon and microorganisms on iron and sulfide concentrations in unpolluted ground water. The concentrations of ferrous iron, sulfide, organic carbon, major ions and the pH and Eh were determined on each water sample. Organic carbon and dissolved ferrous iron were readily measureable in samples. Organic carbon was generally present at low levels (2 mg/l). Even though thee was no evidence of coliform or streptococcus microorganisms none of the water samples was sterile. Two to six genera of non-pathogenic bacteria were present in each sample, the majority being nitrate reducers. Sulfate-reducing bacteria were detected in half of the samples. The data suggest that there is a poor correlation between the redox potential and dissolved organic carbon in ground water. The organic carbon content of the rocks appears to be a more important factor in controlling the redox potential of ground water. The data for nitrate-ammonia and sulfate-sulfide indicate that many of the water samples were not in internal equilibrium with respect to oxidation-reduction reactions. (Carpenter-Missouri)
W79-02908

ADSORPTION, MOBILITY AND DEGRADATION OF CYANAZINE AND DIURON IN SOILS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W79-02909

ATRAZINE PERSISTENCE IN A VALENTINE LOAMY FINE SAND PROFILE,
Nebraska Univ., Lincoln. Dept. of Agronomy.
R. H. Hammons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 492, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, May 1977. 48 p, 1 fig, 17 tab, 42 ref. OWRT B-030-NEB(4), 14-34-0001-5087.

Descriptors: Water quality, *Herbicides, Irrigation, *Atrazine, *Loam, Soil profiles, Sands, Pesticide residues, Path of pollutants, Water pollution.

The persistence data indicate that atrazine dissipation in irrigated Valentine loamy fine sand occurs at a rate greatly exceeding that expected for this soil texture. Atrazine is rapidly degraded in the top 6 inches of soil and mobility data show that the major portion of surface applied atrazine remains in this layer. Atrazine losses by volatilization seemed to occur most prevalently within 1 or 2 days after the initial application. These losses appear to be very dependent on soil moisture and soil temperature. Conversion of atrazine to hydroxyatrazine by photodecomposition or hydroxylation did not seem to cause a major portion of the dissipation of atrazine. The low amount of hydroxyatrazine formation may be related to the fact that this soil has a low exchangeable hydrogen, clay and organic matter content. Therefore, this conversion would not occur readily. The primary factor of atrazine dissipation in these studies has not been clearly shown. The addition of water enhances this dissipation, possibly by increasing or stimulating the microbial population of the soil, or by influencing chemical conversion of atrazine to forms other than hydroxyatrazine. Therefore, in irrigated sandy soils, it appears that contamination of soil or groundwater is not a major problem when recommended rates of atrazine are used.
W79-02910

AN INEXPENSIVE AND EASILY FABRICATED SAMPLER FOR COLECTING SEDIMENT CORES TO MEASURE EH POTENTIALS,
University of West Floida, pensacola. Faculty of Biology.
For primary bibliographic entry see Field 7B.
W79-02917

CHEMICAL ANALYSIS OF MINE DRAINAGE WATERS,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
T. R. Wildeman, A. J. Wildeman, and R. Ramirez.
In: Molybdenum in Environment, Vol. 2, W. R. Chappell and K. K. Petersen eds., Marcel Dekker Inc., p. 739-751, 1977.

Descriptors: *Pollutant identification, Water pollution, Mine drainage, Water quality, Water chemistry, *Chemical analysis, *Iron, *Sulfates, Analytical techniques, *Colorado(Front range).

A scheme is described for the analysis of the constituents in mine drainage waters, with particular attention being paid to the problems that the high iron and sulfate concentrations might cause in standard analytical methods. Iron, manganese, zinc, copper, sodium, potassium, magnesium, cadmium, and lead can be accurately analyzed in mine drainages using direct analysis by atomic absorption specrometry. However, the matrix can interfere in the analysis of calcium and methods for eliminating the interference using different chelating agents met with only limited success. The analysis of trace amounts of copper, lead, and cadmium in mine drainage by anodic stripping voltammetry appears to be a promising alternate method when solvent extraction cannot be used.
W79-02918

CHEMICAL LIMNOLOGY OF THE NORTH CHANNEL, 1974,
Department of Fisheries and Environment, Burlington (Ontario). Water Quality Branch.
N. D. Warry.
Scientific Series No. 92, 1978, 12 p., 4 fig., 8 ref., 4 tab.

Descriptors: Limnology, *Water chemistry, *Chemical analysis, *Water quality, *Trace elements, Seasonal, Sampling, Data collections, Parametric hydrology, *Canada, Lake Huron, Georgian Bay, *North Channel, *St. Mary's River, *Water exchange.

Analysis of North Channel water collected on seven surveys between April and December 1974 permitted a comprehensive chemical definition of this water body. Using these data, it was possible to define three distinct areas of water in the North Channel. It also was found that the chemical quality of the North Channel is determined mostly by the water quality of the St. Marys River. An estimate of water exchange between the North Channel and Lake Huron was calculated using the chemical data. It indicated that 17% of the total volume of the North Channel may be exchanged during a one-year period. The North Channel is small enough that man's impact on the water chemistry can be seen. This is best demonstrated by its elevated ammonia concentrations. Soluble trace metal concentrations exhibit a seasonal variation in the North Channel, very similar to that observed in Georgian Bay. (WATDOC)
W79-02921

CHEMICAL LIMNOLOGY OF GEORGIAN BAY, 1974,
Department of Fisheries and Environment, Burlington (Ontario). Water Quality Branch.
N. D. Warry.

Scientific Series No. 91, 1978, 13 p, 6 fig, 19 ref, 4 tab, append.

Descriptors: Limnology, *Nutrients, *Chemicals, *Silicates, *Ions, Alkalinity, Variability, Surface waters, Trace elements, Watersheds(Basins), Epilimnion, Hypolimnion, Data collections, *Canada, *Georgian Bay, *Lake Huron.

Seven complete chemical surveys of Georgian Bay were conducted between April 28 and December 6, 1974. The observed distributions and open water concentrations of seven major ions (Ca, Mg, Na, K, Cl, SO42, alkalinity), six trace metals (Cu, Ni, Fe, Pb, Mn, Zn), and six nutrients (total P, dissolved reactive P, total dissolved P, NO3 + NO2, NH3 and reactive silicate) are presented. Comment on the probable causes of the observed concentrations and their distribution patterns has been included. In addition, the overall chemical composition of Georgia Bay is discussed in terms of its controlling variables. In order of importance these are (1) exchange with Lake Huron, (2) lithology of the drainage basin, (3) the effect of the Frech River, (4) exchange with North Channel and (5) human activity in the drainage basin. (WATDOC)
W79-02923

THE DETECTION OF HEIGHTENED SEA-WATER COPPER CONCENTRATIONS BY THE MUSSEL MYTILUS EDULISL,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
J. Davenport, and A. Manley.
Journal of the Marine Biological Association of the United Kingdom, Vol. 58(4) 1978; p 843-850, 3 tab, 3 fig, 11 ref.

Descriptors: *Metals, *Copper, Bioassay, Toxicity, Mortality, *Mussels, Molluscs, Animal behaviour, *Laboratory tests, Animal physiology, Water pollution effects, Methodology, Laboratory equipment, *Behavioral reactions, Mytilus edulis.

An acute toxicity threshold of 0.09-0.10 ppm added copper was determined for specimens of Mytilus edulis from the Menai Strait which were exposed to copper (as CuSO4)in a flowing sea-water system. Results are presented which show that the closure response of the mussel to added copper is a three-part process. First, a sharp adduction of the shell valves is seen at a mean total copper concentration of only 0.021 ppm, then as the copper concentration rises, 'testing' behaviour is observed and finally the shell valves close to isolate the animal from its environment. The complete valve closure mechanism only operates at added copper concentrations of 0.2 ppm or more. The initial behavioural reaction of valve adduction at low concentration occurred at a significantly higher mean total copper concentration (0.16 ppm) in mussels which had been previously acclimated to 0.02 ppm total copper in sea water for 10 days. (EIS-Katz)
W79-02960

PLANT COMPETITION FOR ATRAZINE,
Nebraska Univ., Lincoln. Dept. of Agronomy.
D. W. Hoffman.
Available from the National Technical Information Service, Sprinfield, VA 22161 as PB-291 556, Price codes: A04 in paper copy, A01 in microfiche. Ph.D. Dissertation, December 1976. 49 p, 6 fig, 18 tab, 21 ref. OWRT B-030-NEB(3), 14-34-0001-5087.

Descriptors: *Herbicides, *Atrazine, *Bioassay, Pesticide residues, Soil analysis, Plant population, Oats, Soybeans.

Greenhouse plant bioassays were initiated to study the effects of plant competition for herbicide residues present in soil. Oats and soybeans were grown in studies to determine the effects of plant population on bioassay sensitivity. Improved bioassay sensitivity to trace levels of atrazine was found by decreasing the number of plants per pot. Optimum sensitivity observed on 450 g of Sharpsburg silty clay loam was at 0.06 ppmw atrazine using five oat plants per pot. The lowest detectable atrazine concentration using soybeans was 0.1 ppmw when 1 or 2 plants were grown per 450 g Keith silty loam. At high plant populations, a loss of sensitivity occurred. However, when higher atrazine concentrations were present in soil, increased plant populations allowed these high levels to be quantitatively measured. A 14C-labeled atrazine study showed that by increasing plant populations from 1 to 6 per pot, atrazine uptake was decreased 50% on a per plant basis. This indicated that plants within the pot were competing for the available atrazine.
W79-02985

5B. Sources Of Pollution

THE CONTAMINATION OF GROUNDWATER BY HEAVY METALS FROM THE LAND DISPOSAL OF FLY ASH,
Notre Dame Univ., IN. Dept. of Civil Engineering.
T. L. Theis, and J. J. Marley.
Report No. TID-27019, December 1975. 7 p, 2 fig, 2 tab. E-(11-1)-2727.

Descriptors: *Water quality control, *Water pollution sources, *Heavy metals, *Groundwater, Mercury, Cadmium, Zinc, Fly ash, Adsorption, Soil chemical properties, Acidity, Alkalinity, Air pollution effects, Sorption, Desorption, Hydrogen ion concentration.

The continuing investigation of heavy metal sorption onto various soils is reported. Emphasis is on the effect of environmental variables in groundwater on the adsorption of heavy metals. An illustration of the effect of pH for cadmium and zinc isotherms show variations suggesting that neutral pH's favor formation of hydroxides, and in doing so, enhance sorption onto soil particle surfaces. Ash type and solution pH influence the desorption of metals from ash particles, and it is concluded that the greater the adsorption tendency of a given metal onto the soil particles, the less its tendency to desorb from the ash. Results of the investigation of mercury release from fly ash show that most ashes released very little mercury over the one day test period, however, several showed that the released mercury was in the elemental form. This mercury is volatile and could disappear from fly ash disposal sites before entering the groundwater environment. The total amount of mercury released for fly ash no. 6 was less than 1% of the total amount contained in the ash. (Davison-IPA)
W79-02507

IDENTIFICATION AND INITIAL EVALUATION OF IRRIGATION RETURN FLOW MODELS,
Irrigation Hydrology Co., Fort Collins, CO.
For primary bibliographic entry see Field 6A.
W79-02510

A REPORT ON THE CONCENTRATION, DISTRIBUTION AND IMPACT OF CERTAIN TRACE METALS FROM SEWAGE TREATMENT PLANS ON THE CHESAPEAKE BAY,
Chesapeake Research Consortium, Inc., Annapolis, MD.
R. J. Huggett, O. P. Brucker, G. R. Helz, and S. E. Sommer
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 735, Price codes: A02 in paper copy, A01 in microfiche. Report No. NSF-RA-E-74-030, CRC No. 31, Virginia Institute of Marine Science Contribution No. 628, June 1974. 19 p, 2 fig, 5 ref. GI-38973.

Descriptors: *Sewage treatment, *Chesapeake Bay, *Trace metals, *Shellfish, Ecosystems, Biota, Effluents, Design criteria, Toxins, Water pollution, Sediments, Sediment rates, Deposition, Sediment yield, Sewage treatment plant sites, Water pollution sources, Oysters, Cadmium, Copper, Chromium, Lead, Zinc.

Preliminary findings of research directed towards ascertaining the impact of metals from sewage treatment plants on the Chesapeake Bay ecosystem, and towards defining the physical-chemical-biological dynamic of these metals once in the estuarine environment are summarized. Metals in sewage and receiving waters, sewage metals in bottom sediments, and sewage metal uptake by oysters are discussed. Trace metals are now entering the Chesapeake Bay from sewage treatment plants in quantities which rival nature. It is recommended that inputs of the potentially toxic metals, cadmium, copper, chromium, lead and zinc, be considered in the design and siting of sewage treatment plants on the Chesapeake Bay. Processes for removing these metals from sewage should be incorporated into treatment designs for plants constructed near production shellfish beds, because accumulations of these metals in the shellfish may render them unusable by man. (Davison-IPA)
W79-02511

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES, UNITED STATES STEEL CORPORATION, IRVIN PLANT, PITTSBURGH, PENNSYLVANIA, AUGUST 18-28, 1975.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 588, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-330/2-75/012, December 1975. 73 p, 5 fig, 9 tab, 7 ref, 4 ap.

Descriptors: *Industrial wastes, *Steel plants, *Monogahela River, *Water quality, Effluents, Water pollution, Organic compounds, Oil, Water pollution sources, Outfall sewers, Monitoring, On-site investigations, Waste water treatment, Neutralization, United States Steel Corporation, Coagulation, Filtration, Oil wastes, Domestic wastes, Pennsylvania, Organic compounds.

United States Corporation's (USSC) Irvin Plant, primarily a steel finishing operation, uses an estimated maximum of 70 mgd of process water from the Monogahela River. Waste water is discharged to the river from two permit discharge points designated as 005 and 006. Waste water treatment facilities located at this plant consist of acid neutralization treatment, waste oil treatment, and domestic waste water treatment. Waste oil treatment effluent is discharged through outfall 005 and domestic effluent through outfall 006. Acid neutralization wastes are transported by railroad tank car to an approved dump for disposal. Waste water discharges from outfalls 005, 006, 106, 306 and 406 were monitored; raw and treated water from the Monogahela were sampled to ascertain the net pollutant concentrations discharged; influent and effluent from the oil waste treatment system was sampled; and flow was measured and pollutant loads calculated for each outfall excepting the oily waste treatment system. During the National Enforcement Investigations Center (NEIC) monitoring period, flows ranged from 13.5 to 18.9 mgd; company self-monitored data was reported at 6.6 to 12.5 mgd. USSC proposed effluent limitations for total suspended solids, oil, grease and dissolved iron are compared with the survey data. Monitoring results and requirements for all outfalls are examined. (Davison-IPA)
W79-02515

DETERMINATION OF THE PRACTICAL VALUE OF TOXIC LOADINGS.
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5C.
W79-02536

AN OVERVIEW OF NUTRIENT CYCLING RESEARCH AT COWEETA HYDROLOGIC LABORATORY,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab
For primary bibliographic entry see Field 4D.
W79-02571

FOREST SERVICE STUDIES OF SOIL AND NUTRIENT LOSSES CAUSED BY ROADS,

LOGGING, MECHANICAL SITE PREPARATION, AND PRESCRIBED BURNING IN THE SOUTHEAST,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
J. E. Douglass, and L. W. Swift, Jr.
In: Watershed Research in Eastern North America: A workshop to compare results, February 28-March 3, 1977, Edgewater, Maryland, Chesapeake Bay Center for Environmental Studies, Smithsonian Institute, Tidemark Printing, Inc., Edgewater, Vol. II, p. 489-503. 1977 8 fig, 11 ref.

Descriptors: *Forest management, *Water quality, Chemical properties, *Stream pollution, Road construction, Road design, Reforestation, Sheet erosion, Turbidity, *Piedmont, *Southern Appalachian Mountains, North Carolina, South Carolina.

Soil and nutrient pollution of streams caused by woods roads, log skidding, mechanical site preparation, and prescribed burning are being studied in the Piedmont and Appalachian Mountains of the Carolinas. Stormflow from disturbed areas is measured by 1-foot H-flumes. Proportional samples for sediment and nutrient analysis are collected by 2-foot Coshocton wheels. Objectives of nonpoint source pollution studies are to establish baseline levels of soil and nutrient loss, determine increases in losses due to certain forestry practices, and develop methods of estimating losses for other practices and other locations. (Forest Service)
W79-02572

SIMULATION OF POTENTIAL EFFECTS OF FOREST UTILIZATION ON THE NITROGEN CYCLE IN DIFFERENT SOUTHEASTERN ECOSYSTEMS,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4D.
W79-02573

NUTRIENT BUDGETS FOR UNDISTURBED AND MANIPULATED HARDWOOD FOREST ECOSYSTEMS IN THE MOUNTAINS OF NORTH CAROLINA,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4D.
W79-02574

WATER QUALITY ASSESSMENT MODEL - OXYGEN DYNAMICS MODEL FOR LOW-FLOW STREAMS,
Civil and Environmental Engineering Development Office, Tyndall AFB, FL.
S. P. Shelton.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 463, Price codes: A03 in paper copy, A01 in microfiche. Air Force Systems Command, Report CEEDO-TR-77-15, March, 1977, NTIS, 27 p, 23 ref.

Descriptors: *Mathematical models, *Water quality, *Oxygen, Mathematical studies, *Streams, Stream flow, Biochemical oxygen demand, Water pollution effects, *Waste assimilative capacity, Waste dilution, Waste water disposal, Oxygen demand, Oxygen requirements, Oxygenation, Low-flow nitrogen compounds.

This investigation was undertaken to develop a low-flow stream waste assimilation model to determine the effect of point source discharges at selected Air Force installations. The impetus for this study was the lack of available low-flow stream models and the AF need to evaluate low-flow streams that traverse their installations. From data acquired by this and previous investigations, an analysis of oxygen sinks and sources, unique in their level of significance for low-flow streams, was undertaken. Oxygen sources and sinks considered were carbonaceous BOD, nitrogenous BOD, stream reoxygenation, benthic oxygen demand, and photosynthesis/respiration. In addition to these, the effects of toxic pollutants upon biological reaction rates and waste assimilative capacity were also explored. Techniques employed in this investigation may be considered as one approach to determine waste assimilation capacity and to simulate variations in the oxygen profile caused by point source wastewater discharges into a low flow stream. The validity and limitations of the overall approach, the ability to extrapolate oxygen profiles, and the ability to transpose conditions to facilitate prediction of future conditions is, at this time, not fully substantiated; however, positive indications have been obtained in model verification that lend credence to the procedures adopted. Future studies should be directed toward validation and improvement of the proposed model and sensitivity analysis to define confidence intervals. (EIS-Katz)
W79-02579

CONCENTRATIONS OF TEN HEAVY METALS IN SOME SELECTED LAKE POWELL GAME FISHES,
New Mexico Univ., Alburguerque. Dept. of Biology.
R. E. Bussey, D. E. Kidd, and L. D. Potter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 026, Price codes: A05 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No 34, J. M. Varady, Ed., 72 p, November 1976, 9 tab, 13 fig, 37 ref.

Descriptors: *Metals, *Freshwater fishes, *Iron, Arsenic compounds, *Cadmium, Calcium, *Chromium, *Copper, *Lead, *Magnesium, *Selenium, *Zinc, Public health, Path of pollutants, Water pollution effects, New Mexico, Rainbow trout, Bass, *Lake Powell.

Ten tissue samples from each of four species of fishes--large-mouth bass, black crappie, walleye, and rainbow trout--from Lake Powell were analyzed and compared for the presence of concentrations of ten heavy metals: iron, calcium, magnesium, copper, chromium, cadmium, zinc, arsenic, selenium, and lead. Samples were digested with nitric and perchloric acids, and analyses were performed by atomic absorption spectrophotometry. Concentrations were expressed on a dry-weight basis for all tissues and were not corrected for percent recovery. Since cadmium, lead, arsenic, and selenium are toxic to humans, the concentrations of these heavy metals in the edible portions of Lake Powell fishes were compared to the maximum safety threshold levels established in several independent studies. At this time, none of the metals, aside from selenium, appears in concentrations high enough to pose a health hazard and should not be cause for concern. However, the high selenium levels in fish flesh may constitute a possible health hazard, although little is known of the factors influencing selenium assimilation in humans. (EIS-Katz)
W79-02582

CONSEQUENCES OF LEACHING FROM PULP AND PAPER MILL LANDFILL OPERATIONS.
Econotech Services Ltd., New Westminster (British Columbia).
Canadian Forestry Service, Ottawa, Ontario K1A OH3, Cooperative Pollution Abatement Research (CPAR) Project Report 363-1, Progress Report to March 31, 1976, 176 p. 2 fig, 21 ref, 48 tab, 2 append.

Descriptors: *Pulp wastes, *Solid wastes, *Landfills, *Leaching, Wastes, Industrial wastes, Waste disposal, Bark, Sludge, Fuels, Sawdust, Leachate, Hydrogen ion concentration, Metals, Ions, Biochemical oxygen demand, Color, Carbon, Methane, Hydrogen sulfide, Wood, Pulp and paper industry, Water pollution sources, Toxicity, Fish, Gases.

Nine paper-industry solid wastes (Douglas-fir bark, western red-cedar bark, biological sludge, several clarifier solids, salt water dredgings, and sawdust hog fuel) were placed in specially designed lysimeters to determine the characteristics of leachates from a simulated 100-inch annual rainfall. Results showed considerable differences between leachates from various sources. Depending on landfill material, leachates can have highly undesirable characteristics, such as low pH and high metal ion content, fish toxicity, total organic carbon, BOD, and color. Some mateials evolve considerable quantities of methane and hydrogen sulfide. With some exceptions, most of the undesirable properties diminished considerably over the first year of study. Settling rates were determined for all materials. Certain soils were effective in removing many undesirable characteristics, but this limited experiment did not include measurement of soil capacity. Overall results clearly indicate that severe leachate problems may arise from landfill disposal of pulp and paper mill waste products or from storage of bark and wood; leachates from bark or wood can be equally undesirable. Biodegradability can vary considerably between leachates. Results of field studies were analyzed in the light of pilot-plant data. The worst material studied, particularly with respect to long-lasting adverse characteristics, was combined clarifier solids from a bleached kraft operation. (Brown-IPC)
W79-02591

ALTERNATIVE POLICIES FOR CONTROLLING NONPOINT AGRICULTURAL SOURCES OF WATER POLLUTION,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 5G.
W79-02619

BASELINE REPORT OF ENVIRONMENTAL CONDITIONS IN DEEPWATER DUMPSITE 106. VOL I: PHYSICAL CHARACTERISTICS.
National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 5E.
W79-02622

BASELINE REPORT OF ENVIRONMENTAL CONDITIONS IN DEEPWATER DUMPSITE 106. VOLUME II: BIOLOGICAL CHARACTERISTICS.
National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 5E.
W79-02623

BIOLOGICAL AVAILABILITY OF POLLUTANTS TO MARINE ORGANISMS,
Center for Energy and Environment Research, Mayaguez, Puerto Rico.
For primary bibliographic entry see Field 5C.
W79-02628

CHEMICAL AND BIOLOGICAL SURVEY OF LIBERTY BAY, WASHINGTON,
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W79-02634

FATE OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) IN THE ENVIRONMENT: SUMMARY AND DECONTAMINATION RECOMMENDATIONS,
Air Force Academy, CO. Dept. of Chemistry and Biological Sciences.
A. L. Young, C. E. Thalken, E. L. Arnold, J. M. Cupello, and L. G. Cockerham.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 491, Price codes: A03 in paper copy, A01 in microfiche. Report USAFA-TR-76-18, 44 p. October 1976. 14 tab, 19 ref.

Descriptors: *Biodegradation, *Herbicides, *Pesticide kinetics, 2,4,5-T, Pesticides, Animal pathology, Path of pollutants, 2,4-D, Pesticide toxicity, Microbial degradation, Persistence, Chemical analysis, Organic compounds, Chlorinated hydrocarbon pesticides, *Bioaccumulation, *Tissue analysis, *Dioxin, *Agent orange, *TCDD.

Studies on the fate of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) have been conducted on biodegradation plots and field test areas that have received

massive quantities of Orange herbicide. From the studies reviewed in this report, it is apparent that (1) although TCDD may persist in the environment for long periods of time (greater than 12 years) when initially present in high concentrations on the soil surface, it may be degraded by soil microorganisms, especially when in the presence of other chlorinated hydrocarbons: (2) TCDD may accumulate in the tissues of rodents, reptiles, birds, fish, and insects when these organisms are exposed to TCDD contaminated soils (however, the levels of TCDD in the tissues apparently do not exceed the levels of TCDD found in the environment; and (3) rodents, reptiles, birds, fish and insects may tolerate, i.e., based on no observed deleterious effects in field studies, soil levels between 10-1,500 ppt TCDD. (EIS-Deal)
W79-02639

SELECTED HYDROLOGIC DATA, 1931-77, WASATCH PLATEAU-BOOK CLIFFS COAL-FIELDS AREA, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02645

HYDROLOGIC DATA FOR URBAN STORM RUNOFF FROM THREE LOCALITIES IN THE DENVER METROPOLITAN AREA, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02646

IMPACT OF FLOW REGULATION AND POWER PLANT EFFLUENTS ON THE FLOW AND TEMPERATURE REGIMES OF THE CHATTAHOOCHEE RIVER -- ATLANTA TO WHITESBURG, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
R. E. Faye, H. E. Jobson, and L. F. Land.
Open-file report 78-528, 1978. 92 p, 31 fig, 10 tab, 21 ref.

Descriptors: *Regulated flow, *Streams, *Powerplants, *Heat flow, *Water temperature, Model studies, Mathematical models, Heat transfer, Unsteady flow, Thalweg, Mannings equation, Roughness(Hydraulic), Diurnal distribution, Temperature, *Georgia, *Chattahoochee River(Geo).

A calibrated and verified transient-flow temperature model was used to evaluate the effects of flow regulation and powerplant loadings on the natural temperature regime of the Chattahoochee River in northeast Georgia. Estimates were made of both instantaneous and average natural temperatures in the river during an 8-day period in August 1976. Differences between the computed average natural temperature and an independent estimate of natural temperature based on observed equilibrium temperatures were less than 0.5C. The combined thermal effects of flow regulation and powerplant effluents resulted in mean daily river temperatures downstreams of the powerplants about equal to or less than computed mean natural temperatures. The range and rates of change of computed natural diurnal temperature fluctuations were considerably less than those presently observed (1976) in the river. Except during periods of peak water-supply demand, differences between computed year 2000 river temperatures and observed present-day temperatures were less than 2C. (Woodard-USGS)
W79-02648

EFFECTS OF BOTTOM SEDIMENTS ON INFILRATION FROM THE MIAMI AND TRIBUTARY CANALS TO THE BISCAYNE AQUIFER, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. L. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 080, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-36, May 1978. 63 p, 29 fig, 6 tab, 20 ref.

Descriptors: *Groundwater recharge, *Surface waters, *Infiltration, *Water quality, *Canals, Water supply, Aquifers, Withdrawal, Water wells, Saline water intrusion, Drawdown, Bottom sediments, Effects, Canal seepage, Data collections, Water analysis, Chemical analysis, Path of pollutants, *Florida, Dade County(Fla), *Biscayne aquifer(Fla).

Infiltration from the Miami Canal and its tributaries is an important source of recharge to the Biscayne aquifer in the vicinity of the Miami Springs-Hialeah well fields. Estimates of pumpage contributed by canal infiltration decreased from nearly 100 percent in the late 1940's to 50 percent in May 1973 while well field pumpage increased from less than 50 Mgal/d to 120 Mgal/d. As increased withdrawals enlarge the well field's cone of depression, the threat of saltwater intrusion during dry periods has been increased. Data on water quality, water levels, and canal bottom sediments indicate that sediments greatly impede infiltration from the canals in the areas most affected by pumping. Bottom sediments reduce coliform bacteria, pesticides, PCB, metals, and other suspended materials infiltrating canal water. (Woodard-USGS)
W79-02653

BACTERIOLOGICAL WATER QUALITY OF TULPEHOCKEN CREEK BASIN, BERKS AND LEBANON COUNTIES, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
J. L. Barker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 403, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 78-53, April 1978. 25 p, 5 fig, 5 tab, 10 ref.

Descriptors: *Water quality, *Baseline studies, *Water pollution sources, *Coliforms, *Bacteria, Livestock, Surface waters, Runoff, Water analysis, Evaluation, *Pennsylvania, *Tulpehocken Creek basin(Penn), Proposed lake site.

A four month intensive study of the bacteriological quality of water in the Tulpehocken Creek basin in southeast Pennsylvania indicates that (1) the streams localy contain high densities of bacteria indicative of fecal contamination, (2) nonpoint waste sources, particularly livestock, are the dominant influence in the excessive bacteriological-indicator counts observed, and (3) retention time of water in the proposed Blue Marsh Lake is believed sufficient to reduce bacteria densities to acceptable levels except following intense rainfall and runoff events during normally low-flow periods. (Woodard-USGS)
W79-02654

PRELIMINARY EVALUATION OF THE WATER-SUPPLY POTENTIAL OF THE SPRING-RIVER SYSTEM IN WEEKI WACHEE AREA AND THE LOWER WITHLACOOCHEE RIVER, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-02655

WATER QUALITY IN THE SUGAR CREEK BASIN, BLOOMINGTON AND NORMAL, ILLINOIS.
Geological Survey, Champaign, IL. Water Resources Div.
B. J. Prugh, Jr.
Available from National Technical Information Service, Springfield, VA 22161 as PB-288 359, Price codes: A03 in paper copy, A01 in microfiche Water-Resources Investigations 78-78, 1978. 40 p, 15 fig, 27 tab, 14 ref.

Descriptors: *Water quality, *Urban runoff, *Sewage effluents, *Storm runoff, *Water analysis, Dissolved solids, Dissolved oxygen, Hydrogen ion concentration, Ammonia, Nitrogen, Phosphorus, Biochemical oxygen demand, Bacteria, Coliforms, Metals, Trace elements, Water temperature, Path of pollutants, *Illinois, *Sugar Creek(Ill), Bloomington, Normal(Ill).

Urban runoff and overflows from combined sewers affect water quantity and quality in Sugar Creek within the twin cities of Bloomington and Normal, Illinois. Water-quality data from five primary and eight secondary locations showed three basic types of responses to climatic and hydrologic stresses. Stream temperatures and concentrations of dissolved oxygen, ammonia nitrogen, total phosphorus, biochemical oxygen demand, and fecal bacteria showed seasonal variations. Specific conductivity, pH, chloride, and suspended solids concentrations varied more closely with stream discharges. Total organic carbon, total nitrogen, total phosphorus, biochemical oxygen demand, and fecal coliform and fecal streptococcal bacteria concentrations exhibited variations indicative of intial flushing action during storm runoff. Selected analyses for herbicides, insecticides, and other complex organic compounds in solution and in bed material showed that these constituents were coming from sources other than the municipal sanitary treatment plant effluent. Analyses for 10 common metals: arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc showed changes in concentrations below the municipal sanitary plant outfall. (Woodard-USGS)
W79-02660

DISTRIBUTION OF DISSOLVED NITRATE AND FLUORIDE IN GROUND WATER, HIGHLAND-EAST HIGHLANDS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
L. A. Eccles, and J. M. Klein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 360, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-14, June 1978. 42 p, 11 fig, 1 tab, 19 ref.

Descriptors: *Nitrates, *Fluorides, *Groundwater, *Water quality, *California, *East Highlands, San Bernardino County(Calif).

In the Highland-East Highlands area of southern California, concentrations of nitrate in water from many wells exceed the U.S. Environmental Protection Agency's and the California Department of Health's recommended limit for public water supplies. The nitrate standards for public water supplies in the study area are commonly met by blending the high-nitrate water with low-nitrate water before distribution; however, some of the low-nitrate water sources have fluoride concentrations that exceed the optimum level, or in a few cases exceed the maximum level recommended by the California Department of Health. Nitrate-nitrogen concentrations in the study area are generally between 1 and 20 milligrams per liter. In general, nitrate-nitrogen concentrations exceeding 10 milligrams per liter are found in water from wells perforated at depths of less than 500 feet. (Woodard-USGS)
W79-02663

PRELIMINARY HYDROLOGIC BUDGET OF THE SAND-AND-GRAVEL AQUIFER UNDER UNSTRESSED CONDITIONS, WITH A SECTION ON WATER-QUALITY MONITORING, PENSACOLA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. Trapp, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 183, Price codes: A04 in paper copy, A01 in microfiche Water-Resources Investigations 77-96, 1978. 57 p, 8 fig, 1 tab, 24 ref.

Descriptors: *Computer models, *Aquifer characteristics, *Hydrogeology, *Water quality, *Path of pollutants, Hydrologic budget, Sewage effluents, Groundwater movement, Potentiometric pollut-

ants, Hydrologic budget, Sewage effluents, Groundwater movement, Potentiometric level, Transmissivity, Confined water, Water analysis, Nutrients, Biochemical oxygen demand, Water wells, Withdrawal, Groundwater recharge, *Florida, *Escambia County, *Pensacola(Fla), *Trescott-Pinder model, Sand-and-gravel aquifer, Effluent-spray disposal.

The sand-and-gravel aquifer is the only freshwater aquifer in southern Escambia County, Fla. Problems related to the development of the aquifer include sustained yield, contamination, and saltwater intrusion. A digital model was applied to the sand-and-gravel aquifer in central and southern Escambia County treating the aquifer's 'main producing zone' as a discrete, leaky, confined aquifer. Under conditions of no pumping, most values for the final-head matrix agreed with assumed values within 4 feet in the area of principal interest. Discharge per unit land area was 1.04 cubic feet per second per square mile, in close agreement with the base runoff streams maintained by the aquifer. Total natural aquifer discharge within the area of principal interest determined by the model was 159 million gallons per day. The applicability of the present non-unique calibration for predicting the effects of pumping is questionable; a multilayered model may be required. Effluent infiltrating from holding lagoons for spray irrigation at the Scenic Hills Sewage Plant may have affected the quality of local perched ground water in the sand-and-gravel aquifer. Observation wells drilled near areas of heavy pumping around Bayou Chico indicated no saltwater intrusion. (Woodard-USGS)
W79-02664

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION, COMPOSITION, AND TRANSPORT OF MICROBIAL BIOMASS AND SUSPENDED MATERIAL IN A SALT MARSH ECOSYSTEM,
South Carolina Univ., Columbia.
C. W. Erkenbrecher, Jr.
PhD Dissertation. 1976. 210 p.

Descriptors: *Salt marshes, *Aquatic microorganisms, *Organic matter, Wetlands, Tidal marshes, Coastal marshes, Aquatic fungi, Chlorophyll, Detritus, Tides, Aquatic bacteria, Suspended load, Sediment transport, Productivity, Estuaries, *South Carolina.

The North Inlet Estuary near Georgetown, South Carolina, was the site for the study of the interactions among aquatic microorganisms and the constantly changing physical and chemical environments. Seasonal fluctuations in water properties were superimposed over the tidal and diurnal factors. Peak concentrations of adenosine triphosphate (ATP) in the summer months coincided with increases in the amount of chlorophyll a. The appearance of peak concentrations of particulate organic carbon (POC) in the early fall was associated with the die-off and washout of components of the standing crop of Spartina. The strong linear correlation between POC and fungi suggested that the latter were attached to and possibly important in the breakdown of the POC formation. Increases in bacterial abundance were generally associated with substantial periods of fresh water runoff in the winter. Critical differences in magnitude and direction of transport were observed between consecutive tidal cycles due to changing local environmental conditions. Biomass carbon was exported from the marsh at a rate of 6 kg per tidal cycle. This was about 19% of the total POC transported. Occasionally, the resuspension of fine sediments on a flooding tide resulted in a significant import of biomass to the creed. (Steiner-Mass)
W79-02673

EFFECT OF TILLAGE SYSTEMS ON RUNOFF LOSSES OF NUTRIENTS, A RAINFALL SIMULATION STUDY,
Iowa Natural Resources Council, Des Moines.
For primary bibliographic entry see Field 4C.
W79-02680

VOLATILE CHLORO- AND BROMOCARBONS IN COASTAL WATERS,
Maryland Univ., College Park, Dept. of Chemistry.
G. R. Helz, and R. Y. Hsu.
Limnology and Oceanography, Vol. 23, No. 5, p 858-869, September 1978. 6 fig, 5 tab, 41 ref. EPA R803839-01/02.

Descriptors: *Water quality, *Chlorination, *Effluents, *Estuaries, *Maryland, Halogens, Chlorine, Carbon, Bromine, Salinity, Volatility, Sampling, Surveys, Rivers, Coasts, Sewage effluents, Analytical techniques, Data processing, Sea water, Chemicals, Chemical analysis, Pollutants, Path of pollutants, Water pollution, *Haloforms, *Back River(MD), Chlorocarbons, Bromocarbons.

Contaminated coastal waters can contain nanomolar levels of C1 and C2 halocarbons originating through in situ synthesis from chlorine and through waste discharge. Haloforms are the major volatile products formed from chlorine. In freshwaters, CHC13 dominates with lesser amounts of CHBr3 and the mixed C1-Br haloforms; however, above about 5 g/kg salinity, CHBr3 is virtually the only product when typical chlorine doses (10-100 micro M) are used. On a molar basis, greater than 4% conversion of chlorine to haloforms was observed in some experiments. Samples from the Back River estuary (Maryland), which receives effluent from a very large urban wastewater treatment plant, contained CH2C12, CHC13, CC14, CC12=CHC1, and CC12=CC12 at concentrations exceeding 1 nM. Even when winter ice cover minimized loss of volatilization, downstream mixing was nonconservative, suggesting that chemical or biological degradation processes occur. Under normal circumstances, however, volatilization followed by chemical degradation in the atmosphere is probably the most important loss mechanism. Data on possible biologic effects of these compounds are critically needed. (Sims-ISWS)
W79-02684

N15/N14 RATIOS OF GROUND-WATER NITRATE, LONG ISLAND, NEW YORK,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler, S. E. Ragone, and B. G. Katz.
Ground Water, Vol. 16, No. 6, p 404-409, November-December 1978. 3 fig, 2 tab, 19 ref.

Descriptors: *Groundwater, *Nitrates, *Isotope studies, *New York, Nitrogen, Water pollution, Fertilizers, Agriculture, Farm wastes, Septic tanks, Pollutants, Path of pollutants, Aquifers, Analytical techniques, Wells, Water wells, Water quality, Water pollution sources, *Long Island(NY).

Nitrogen-isotope values (delta N15) of groundwater nitrate on Long Island, New York, correlate with delta N15 ranges of nitrate sources which contribute to the groundwater systems. The delta N15 of nitrate in water from the upper glacial aquifer, the water table aquifer on Long Island, shows a shift from lighter values in the eastern part of the island where land is used predominantly for agriculture, to heavier values toward New York City where land is used for suburgan residences with septic systems or sewers. The delta N15 values for inorganic fertilizer, unfertilized cultivated fields, and animal wastes show a similar shift from low to high values: -3 to +2 parts per thousand, +2 to +8 parts per thousand, and +10 to +20 parts per thousand, respectively. Nitrogen-isotope ratios of nitrate in water from the deeper Magothy aquifer indicate a mixed source of nitrate. (Sims-ISWS)
W79-02689

SOLUTION OF COUPLED NONLINEAR ECOSYSTEM EQUATIONS,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W79-02714

NON-POINT SOURCE WATER QUALITY MONITORING, INYO NATIONAL FOREST, 1975,
California Univ., Los Angeles. Environmental Science and Engineering.
For primary bibliographic entry see Field 5A.
W79-02718

BIOLOGICAL PRODUCTIVITY IN TWO GEORGIA RIVER SWAMPS,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 2H.
W79-02720

SIMULATION OF NUTRIENT LOSS FROM SOILS DUE TO RAINFALL ACIDITY,
Corvallis Environmental Research Lab., OR.
J. O. Reuss.
Publication No. EPA-600/3-78-053, May 1978. 45 p, 12 fig, 4 tab, 18 ref.

Descriptors: *Rainfall acidity, Water analysis, Water chemistry, Soil science, Soil chemistry, Plant nutrition, Ecology, *Simulation analysis, *Model studies, *Nutrients.

A simulation model is described that provides a quantitative system utilizing established relationships from soil chemistry to predict the most likely effect of rainfall acidity on the leaching of cations from noncalcareous soils. The model utilizes the relationships between lime potential (pH - 1/2pCa) and base saturation described by Clark and Hill (Soil Sci. Soc. Amer. Proc. 28:490-492, 1962) and Turner and Clark (Soil Sci. 99:194-199, 1964), the equilibrium between CO2 partial pressure and H+ and HC03- in solution, the apparent solubility product of AL(OH)3, the equilibrium of cations and anions in solution, the Freundlich isotherm description of ions between the solution and sorbed or exchangeable phases. Ionic composition of leachates in response to rainfall composition can thus be computed. Ions considered in the present version are H+, Ca2+, Al3+, SO42-, CL-, and HC03-. The model predicts almost exact chemical equivalence between basic cation removed in the leachate and strong acid anions entering the system in the rainfall of pH - 1/2pCa is above 3.0, at which point the base saturation will generally not exceed 20%. At lower pH - 1/2pCa values leaching of anions in association with H+ and Al3+ becomes significant and these cations predominate when pH - 1/2pCa falls below 2.0. (Skogerboe-Colorado State)
W79-02730

TRANSPORT OF AGRICULTURAL CHEMICALS FROM SMALL UPLAND PIEDMONT WATERSHEDS,
Environmental Research Lab., Athens, GA.
C. N. Smith, R. A. Leonard, G. W. Langdale, and G. W. Bailey.
Publication No. EPA-600/3-78-056, May 1978. 364 p, 96 fig, 177 tab, 41 ref, 8 append.

Descriptors: Herbicides, Fertilizers, *Pesticides, Surface runoff, *Small watersheds, *Agricultural chemicals, *Path of pollutants, Water pollution sources, *Southeast US, Southern Piedmont region.

Data were collected from four small watersheds (1.3 to 2.7 ha) located in the Southern Piedmont region. Two watersheds were managed without conservation measures; the other two watersheds were parallel-terraced and included grassed waterways for soil erosion control. Total losses of applied herbicides were affected by the occurrence of runoff in close proximity to application date, mode of application, and persistence in the soil runoff zone. Most of the total annual losses by runoff were in the first three runoff events for all compounds except paraquat. Runoff of trifluralin was very low (0.1 to 0.3% of the annual application). Total runoff losses of other herbicides were commonly less than 1.0% except when runoff occurred shortly after application. Sediment yield from terraced watersheds was significantly less than from watersheds managed without terraces.

Except for paraquat, however, pesticide yields in runoff were not reduced in proportion to sediment reduction because solution transport was the major mode of loss for the soluble herbicide phase. Annual runoff losses of soluble plant nutrients were 5.0 and 1.3 kg/ha for chloride and nitrate, respectively. Losses of soluble phosphorus from both watersheds were very low, about 380 g/ha. (Skogerboe-Colorado State)
W79-02745

A CONCEPTUAL ECOLOGICAL MODEL FOR CHESAPEAKE BAY,
For primary bibliographic entry see Field 2L.
W79-02746

ENERGY FLUX IN A TIDAL CREEK DRAINING AN IRREGULARLY FLOODED JUNCUS MARSH,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W79-02748

FACTORS AFFECTING TEMPERATURE AND SALINITY CONDITIONS ON A SCOTTISH SALT-MARSH, WITH NOTES ON THE ECOLOGY OF SPHAEROMA RUGICAUDA (LEACH),
Edinburgh Univ. (Scotland). Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W79-02754

SOILS OF THE INTER-TIDAL MARSHES OF DIXIE COUNTY, FLORIDA,
Florida Agricultural and Mechanical univ., Tallahassee. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W79-02757

CHEMICAL CHARACTERISTICS OF A FEEDLOT SOIL PROFILE,
Agricultural Research Service, Lincoln, NE.
G. E. Schuman, and T. M. McCalla.
Soil Science, Vol. 119, No. 2, p 113-118, February, 1975. 6 fig, 2 ref.

Descriptors: *Feedlots, *Soil profiles, *Soil chemical properties, Nitrates, Potassium, Impermeable layer.

This study was made to determine the chemical composition of feedlot profiles, which might be helpful in understanding the characteristics of feedlot soil profile and the effects of the observed characteristics on the profile. The exchange complex was predominantly saturated with K in the top 15 cm of the soil profile immediately below the manure pack. Ca became the dominant ion below that depth. The high K resulted from large amounts of K in the rations fed to the livestock. The zone where high levels of K were present was also high in carbon. This zone was very dark and slightly more dense than the material above and below. The permeability of this dark layer was low. Soil columns leached with CaC12 allowed percolation to occur, which indicated that the sealing was at least partially due to the K. No percolate resulted from the distilled water of KC1 solution treatments. NO3-N was very low under the impermeable layer and severalfold higher in the field profile. (Cartmell-East Central Oklahoma)
W79-02783

CHARACTERIZATION AND EVALUATION OF WASTEWATER, UNITED STATES STEEL CORPORATION, HOMESTEAD WHEEL AND AXLE PLANT, MCKEES ROCKS, PENNSYLVANIA, AUGUST 21-28, 1975.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5G.
W79-02791

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES, UNITED STATES STEEL CORPORATION, DUQUESNE PLANT, PITTSBURGH, PENNSYLVANIA, FEBRUARY 26-MARCH 6, 1976.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5G.
W79-02793

PCBS WATER ELIMINATION/REDUCTION TECHNOLOGY AND ASSOCIATED COSTS, MANUFACTURERS OF ELECTRICAL CAPACITORS AND TRANSFORMERS,
Versar, Inc., Springfield, VA.
For primary bibliographic entry see Field 5D.
W79-02800

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, EDGAR THOMPSON PLANT, PITTSBURGH, PENNSYLVANIA, JULY 22-AUGUST 5, 1975.
National Enforcement Investigations Center, Denver, CO
For primary bibliographic entry see Field 5G.
W79-02801

STABILITY OF HUMAN ENTEROVIRUSES IN ESTUARINE AND MARINE WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
S. Lo, J. Gilbert, and F. Hetrick.
Available from the Natinal Technical Information Service, Springfield, VA 22161 as AD-A033 356, Price codes: A02 in paper copy, A01 in microfiche. Applied and Environmental Microbiology, Vol. 32, No. 2, p. 245-249, August 1976. 5 p, 4 fig, 3 tab, 12 ref. N0014-67-0239-0035.

Descriptors: *Enteric viruses, *Water pollution sources, *Estuaris, *Estuarine environment, *Marine environment, Laboratory tests, On site tests, Salinity effects, Saline waters, Temperature effects, Water temperature, Viability, Microbiology, Viruses, Human diseases, Water pollution effects.

Three enteric viruses, poliomyelitis type 1, echoviurus-6, and coxsackieviurs B-5, were studied to determine the effects of temperature and salinity on their survival. Marine and estuarine in situ studies and controlled laboratory studies conducted indicated that temperature rather than salinity is the critical factor affecting their stability: higher temperatures resulted in a more rapid loss of viral activity. All the viruses were stable at 4C, with coxsackievirus B-5 being the most stable, showing activity after 53 weeks incubation at all salinities in the laboratory. In situ study results indicated that these viruses are more labile in natural waters than in artificially prepared marine and estuarine waters. Coxsackievirus B-5 was the most stable under all conditions, echovirus-6 was intermediate, and poliovirus type 1 was the least stable. (Davison-IPA)
W79-02803

CHARACTERIZATION OF PRODUCT TANKER SLOP WATERS,
Exxon Research and Engineering Co., Florham Park, NJ. Environmental Control and Safety Div.
J. E. Shewmaker.
Available from the National Technical Information Service, Springfield VA 22161 as PB-254 987, Price codes: A04 in paper copy, A01 in microfiche. Final Report Nos. MA-RD-930-76054 and EE.10TMR.76, June 1976. 53 p, 1 fig, 28 tab, 20 ref, 1 append. C-5-3800.

Descriptors: *Water pollution sources, *Waste identification, *Ships, *Chemical analysis, Sampling, Testing, Oil wastes, Water pollution control, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Phenols, Organic wastes, Organic compounds, Sulfides, Bilge water, Treatment facilities, Design criteria, Waste water treatment, Slop water.

The slop and bilge waters of seven product tankers were sampled and analyzed, and their pollution characteristics were determined to provide a basis for planning shore treatment facilitis for product tanker waste waters. Product residues contaminating the waters included: regular, high test, and unleaded gasoline; heating oils; No. 5, No. 6, and low sulfur fuel oils; diesel fuel; kerosene; and aromatic naphthas and solvents. Samples were analyzed for the following parameters: total oil, chemical oxygen demand (COD), biochemical oxygen demand (BOD5), total organic carbon (TOC), total oxygen demand (TOD), suspended solids, phenols, sulfides, ammonia, and pH. Oil was the principal pollutant; COD, BOD5, and suspended solids often exceeded regulatory limits for discharge from shore stations. Occassional significant levels of phenols and sulfides were found in slop waters but rarely in bilge waters. Ammonia and pH were not significant pollutants in these waters. It is noted that if the treatment of tanker waste waters is to be combined in facilities treating fresh water waste streams, the possible harmful effects of salinity and the hydraulic and contaminant loadings must be considered. (Davison-IPA)
W79-02805

USE OF NEUTRON ACTIVATABLE TRACERS FOR SIMULATING WATER AND CHEMICAL FLOW THROUGH POROUS MEDIA,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
F. G Haaser, W. A. Jester, W. R. Heald, A. S. Rogowski, and H. B. Pionke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 337, Price codes: A14 in paper copy, A01 in microfiche. Research Project Technical Completion Report, September, 1978. 317 p, 65 fig, 10 tab, 118 ref, 8 append. OWRT A-046-PA(2), 14-34-0001-6039.

Descriptors: *Halogens, *Bromides, *Iodides, *Water pollution sources, *Tracers, *Groundwater, *Neutron activation analysis, *Hydraulic conductivity, Chlorine, Soil water movement, Path of pollutants, *Radioactive tracers, Deep system, Shallow soil system, Post-sampling, Hydraulic velocity.

The need for non-contaminating underground water tracers is significant. The imbalance between the natural distribution of water in space and time and the distribution man desires will grow with time. This study examines the application of three halogen water tracers - bromine, iodine, and chlorine - and offers recommendations on their acceptibility for use in various soils. The bromide ion is a most dependable, accurate tracer for monitoring tests at different well sites. In one test this ion reproduced the accuracy of tritiated water, the best recognized but radioactive and therefore 'polluting' tracer. Application results for the iodide ion as a tracer are described for water tracing of 'deep' systems and limited success for shallow soil systems are demonstrated. The chloride ion, is acceptable for water tracing in a shallow soil system Simultaneous injection of combinations of these inexpensive tracers into water systems, and subsequent detection using post-sampling neutron activation analysis allows an independent estimation of average hydraulic velocities and the calculation of hydraulic conductivities from classical hydrologic methods. (Sink-Penn State)
W79-02814

ANALYSIS AND CHARACTERIZATION OF TRACE ELEMENTS IN SHALE OIL PRODUCTS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS.
Missouri Univ.-Columbia. Dept. of Chemistry
For primary bibliographic entry see Field 5A
W79-02822

DISSOLUTION POTENTIAL OF SURFICIAL MANCOS SHALE AND ALLUVIUM,
Colorado State Univ., Fort Collins.
J. B. Laronne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 464.

Price codes: A07 in paper copy, A01 in microfiche. PhD Dissertation, 1977. 128 p, 21 fig, 13 tab, 53 ref, append. OWRT B-121-COLO(1), 14-31-0001-5061.

Descriptors: *Salinity, *Colorado River Basin, *Mancos Shale, Salt source, *Salts, *Sulfates, *Dissolved solids, *Alluvium, *Sediments, Salt deposits, Water chemistry, Conductivity, *Dilution, Water quality.

The objectives were to determine the salt content of Mancos Shale and associated alluvium and the release mechanisms of salt from these deposits. When mixed with distilled water, the time necessary to approach equilibrium decreased with an increase of salt content and with a decrease of sediment concentration, and the time span required for equilibrium ranged from a few minutes to several days. The chemical quality of the aqueous mixtures was of the Ca2+-MG2+-Na1+-SO42--HCO31- type. Sodium and magnesium hydrated sulfates appeared to dissolve faster than gypsum or calcite and the relative abundance of Na1+, Mg2+ and SO42- decreased with increased dilution. There is a large inherent variability in the salt content of sampled sediments. Soluble mineral content of Mancos Shale from hillslopes (2 percent) is significantly larger than that of terrace alluvium (0.62-0.29 percent) and bed materials (0.93-0.81 percent) of North Miller and West Salt Creeks respectively. The most saline deposits (10 percent) are efflorescent bed crusts. Terrace and bed materials in narrow valleys where shallow alluvium overlies shale are highly saline (1.6 percent) and show an increase in salt content with depth. The results also show that major areas of diffuse sources of salts are also the major sediment contributors in the Upper Colorado River Basin.
W79-02827

IMPLEMENTATION AND EVALUATION OF THE USE OF A TRANSIENT FLOW MODEL IN ASSESSING THE IMPACT OF URBAN STORMWATER RUNOFF ON THE WATER QUALITY OF THE TENNESSEE RIVER AT KNOXVILLE,
Tennessee Univ., Knoxville.
J. L. Hamby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 462, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, March 1977. 97 p, 41 fig, 7 tab, 9 ref, 3 append. OWRT A-043-TENN(2).

Descriptors: *Urban runoff, *Storm runoff, Water quality, Model studies, Evaluation, *Tennessee, Knoxville(Tenn), *Transient flow models, Sampling, Methodology, *Tennessee River(Tenn), Flow, Runoff, *Dissolved oxygen, Conductivity, Water temperature, Coliforms, Bacteria, Monitoring, Hydrogen ion concentration, Biochemical oxygen demand.

This study was part of an ongoing research project concerned with the impact of urban stormwater runoff on the water quality of the Tennessee River at Knoxville. This study attempted to implement the use of a transient flow model for examination of water quality during runoff events. Specifically, the model was used to trace a slug of water from a point on the Tennessee River above Knoxville to a point below the city during a runoff event. A sampling methodology was developed which, when used in conjunction with the flow model, allowed graphical prediction of water quality changes in the slug of water as it moved past the city. Application of the flow model to this research provided little information into the analysis of the effects of urban stormwater runoff on the water quality of the receiving river. Specific parameters monitored include temperature, dissolved oxygen, pH, conductivity, biochemical oxygen demand and fecal coliform bacteria. For the five test runs included in this study, only one parameter, dissolved oxygen, was observed to exceed stream standards. No general trends could be determined for any of the parameters which seemed to fluctuate according to conditions specific to each rainfall-runoff event.
W79-02828

INTERACTION BETWEEN LANDFILL LEACHATES AND CARBONATE-DERIVED RESIDUAL SOILS,
Missouri Univ.-Columbia. Dept. of Geology.
D. L. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 463, Price codes: A06 in paper copy, A01 in microfiche. M. A. Thesis, August 1974. 99 p, 15 fig, 12 tab, 33 ref, 2 append. OWRT B-077-MO(2), 14-31-0001-3608.

Descriptors: *Groundwater, *Organic carbon, *Landfill leachate, *Missouri, *Landfills, Sampling, Pollutant identification, Residual soils, Carbonates, Iron, Sulfate, Hydrogen sulfide, *Percolation, Kaolinite, Absorption, Water pollution sources.

One of the major sources of organic carbon in ground water systems in Missouri is leachate from improperly located and/or improperly operated sanitary landfills. Several leachate samples were collected from eight landfill operations in Missouri and analyzed for twenty-one constituents including organic carbon, iron, sulfate, and hydrogen sulfide. The mean organic carbon content of the leachates studied was approximately 4,000 mg/l carbon. These landfill leachates are typically about 40 times more potent than septic tank or sewage treatment plant effluent in terms of their relative ability to lower the redox potential of groundwater systems. Percolation experiments were conducted to evaluate the capacity of the kaolinitic soils from central and southern Missouri to remove organic carbon from leachate. This study showed that less than 5 percent of the organic carbon is removed from the leachate by absorption or entrapment by this kind of treatment. This suggests that sanitary landfills located on residual soils in the Ozarks region of Missouri may pose a greater threat to groundwater quality than is presently suspected. (Carpenter-Missouri)
W79-02829

POLLUTION FORECAST IN STREAMS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
C. Hung-Darth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 440, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, July 1978. 92 p, 40 fig, 7 tab, 47 ref, 2 append. OWRT A-103-MO(1), USDI-OWRT-14-34-0001-8027.

Descriptors: Accidental spills, *Dispersion, Dispersion coefficient, Fickian models, Longitudinal dispersion, *Modified Fickian models, *Pollution forecast, River, *River pollution, Streams, Water pollution sources, *Forecasting, *Model studies, Missouri, United States, Methodology.

Pollution forecast for major rivers in the U.S. necessitates the use of a simple one-dimensional model of dispersion. The Fickian one-dimensional model does not adequately describe longitudinal dispersion in natural stream. A modified Fickian model is proposed herein which is able to describe dispersion in natural streams adequately. A procedure is suggested for using this modified Fickian model for pollution forecast in rivers such as the Missouri.
W79-02831

A PRELIMINARY INVESTIGATION OF THE PHOSPHORUS LOADING CHARACTERISTICS OF LAKE CARNEGIE, PRINCETON, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
R. B. Paterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 418, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, August 1977, 131 p, 57 fig, 14 ref, 6 append. OWRT A-047-NJ(2), 14-34-0001-7064.

Descriptors: Lakes, Sedimentation, Chemical analysis, Plant growth, Water polluton sources, Water pollution effects, *New Jersey, *Lake Carnegie(NJ), *Path of pollutants, Nutrients, *Phosphorus, *Phosphates, Eutrophication, Algae, Oxygen.

Phosphorus transport to Lake Carnegie, Middlesex County, New Jersey, has been studied intensively. Results are consistent with the observed highly eutrophic state of the Lake. Discharges accompanying severe storm events, characterized by a lower flow exceeded only 10% of the time, account for more than half the total phosphorus burden. Point-source impacts are difficult to assess. The Stony Brook behaves relatively simply; point dischargers are a well-defined, small portion of the total load. The Millstone River behaves in a very complex fashion, as a 'natural' tertiary treatment system. Point-source loads, estimated from NPDES data, are twice as large as calculated total loads. Thus, phosphorus is removed by in-stream processes. Baseflow loads are a combination of low- and moderate-flow background and point-source discharges, with removal. Very high flow transport dominates phosphorus movement, contributing to the Lake biological state. The Stony Brook and Millstone River contribute nearly equally. Phosphorus from point sources in the Upper Millstone Basin is greatly reduced before reaching the Lake. Formal treatment to reduce phosphorus from point discharges may have marginal impact on Lake state.
W79-02835

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT MODEL FOR THE ANALYSIS OF CONTAMINANT TRANSPORT IN VARIABLY SATURATED POROUS MEDIA, USER'S GUIDE,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
G. Segol.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 326, Price codes: A10 in paper copy, A01 in microfiche. Report June 1976. 210 p, 10 fig, 2 tab, 12 ref. OWRT C-5224(No 4214) (4), 14-31-0001-4214.

Descriptors: *Groundwater flow, *Mass transport, Finite element method, *Finite element analysis, Equations, *Porous media, Computer programs, *Infiltration, *Model studies, *Path of pollutants, Water pollution sources.

Solutions of the three-dimensional equations for flow and mass transport in a saturated-unsaturated porous medium are obtained by the Galerkin-finite element method. The corresponding computer code written in FORTRAN IV language is presented, as well as its two-dimensional counterpart. Usage information is provided for both models. A one-dimensional infiltration problem is used to check the procedure. The results are found in agreement with existing experimental data.
W79-02838

LONG-TERM ASPECTS OF THE ENVIRONMENTAL BURDEN FROM ENERGY PRODUCTION: CO2 AND 3H, (IN GERMAN),
Kernforschungsanlage Juelich G.m.b.H. (West Germany). Programmgruppe Systemforschung und Technologische Entwicklung.
For primary bibliographic entry see Field 5A.
W79-02855

THE ACCUMULATION, TRANSLOCATION AND DEGRADATION OF BIOCIDES AT LAND WASTEWATER DISPOSAL SITES: THE FATE OF MALATHION, CARBARYL, DIAZINON, AND 2,4-D BUTOXYETHYL ESTER,
California Univ., Berkeley. Sanitary Engineering Research Lab.
D. Jenkins, S. A. Klein, M-S. Yang, R. J. Wigenet, and J. W. Biggar.
Water Research, Vol. 12, p 713-723, 1978. 5 fig, 5 tab, 3 ref.

Descriptors: *Pesticides, *Waste water disposal, *Water quality, *Translocation, *Degradation(Decomposition), Waste water treatment, Waste disposal, Public Health, Pesticide ki-

netics, Pesticide residues, 2,4-D, Diazinon, Water reuse, Irrigation water.

Waste disposal on the land has been practiced since pre-Biblical times and the capacity of the land to purify wastewater has often been demonstrated. It is, however, necessary to examine the large-scale and widespread use of land wastewater disposal in the context of current regulatory attitudes, for its effect on both the land, the water quality of adjacent or underlying waters, and for associated risks (public health or otherwise). This research addresses the specific problems of translocation and accumulation of biocides during the spray irrigation of wastewater. (EIS-Deal)
W79-02890

CHLORINATED PESTICIDES AND HEAVY METALS IN STREAMS AND LAKES OF NORTHERN MISSISSIPPI WATER,
Rust Coll., Holly Springs, MS.
T. I. Rihan, H. T. Mustafa, G. Caldwell, Jr., and L. Frazier.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 568-572, 1978. 2 fig, 2 tab, 4 ref.

Descriptors: *Lead, *Mercury, *DDT, *Pesticide residues, Aldrin, Heptachlor, Water quality, Water analysis, Water chemistry, Chlorinated hydrocarbon pesticides, Heavy metals, Gas chromatography, Physicochemical properties, Agricultural chemicals, Pesticide kinetics, Mississippi, *Lindane.

Water from several Northern Mississippi sources was analysed for; several basic characteristics (e.g. hardness, pH, etc.); water soluble heavy metal ion concentration; and organic pesticide content. The relative absence of lead and mercury and the abundance of several pesticides, especially DDT were attributed to the agricultural nature of the region. (EIS-Deal)
W79-02900

FATE AND EFFECTS OF CRUDE OIL SPILLED ON PERMAFROST TERRAIN. FIRST YEAR PROGRESS REPORT,
Army terrestrial Sciences Center, Hanover, NH.
C. Collins, F. Deneke, T. Jenkins, L. Johnson, and T. McFadden.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 140, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency, Special Report 76-15, 18 p, November 1976. 14 fig, 4 tab, 3 ref.

Descriptors: *Oil, *Oil spills, *Pipelines, *Permafrost, Oil pollution, Alaska, Tundra, Frozen ground, Soil types, Chemical degradation, Organic compounds, Microbial degradation, Path of pollutants, Physicochemical properties, *Crude oil.

The long-term effects and ultimate fate of crude oil spilled on permafrost-underlain tundra is the subject of this study. The project involves two experimental oil spills of 2000 gallons each on 500-m2 test plots near Fairbanks, Alaska. A winter spill, discussed in this progress report, took place in February 1976. Another spill will take place at the peak of the growing season in the summer. This allows conditions prevailing during these climatic periods to be studied as to their effect on oil spills, and makes it possible to study the reaction of the spilled oil to these temperature extremes. Monitoring of the spill and control plots includes: oil movement, temperature regime, biological effects, microbiological changes, permafrost impact, and chemical degradation of the oil. (EIS-Deal)
W79-02902

THE POTENTIAL AND REALIZED INFLUENCES OF TEMPERATURE ON THE DISTRIBUTION OF FISHES IN THE NEW RIVER, GLEN LYN, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W79-02903

THE EFFECT OF ORGANIC CARBON ON THE CONCENTRATIONS OF IRON AND HYDROGEN SULFIDE IN GROUND WATER,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W79-02908

ADSORPTION, MOBILITY AND DEGRADATION OF CYANAZINE AND DIURON IN SOILS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
J. T. Majka.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 564, Price codes: A03 in paper copy, A01 in microfiche. MS Thesis, January 1976, 40 p, 7 fig, 5 tab, 30 ref, append. OWRT B-030-NEB(2), 14-34-0001-5087.

Descriptors: *Herbicides, *Adsorption, *Mobility, *Cyanazine, *Diuron, *Path of pollutants, *Clays, Loam, Soils, Soil types, *Adsorption, *Degradation(Decomposition).

Cyanazine and diuron movement in a Monana silty clay loam soil in the field was not detected at soil depths below 5 cm in plots receiving cumulative amounts of water totaling 20 cm over a 54-day period. In hand-packed soil columns, surface applied diuron and cyanazine penetrated to depths of 10 and 20 cm, respectively, when leached over a time period and with amounts of water similar to that used in the field. Soil thin layer chromatography and adsorption isotherms studies showed diuron to be more strongly adsorbed than cyanazine. Both compounds showed greater degradation rates at the higher temperatures when studied at 4, 20, 35 and 50C and over a 20-week period. Degradation was slowest at 5C in a Valentine loamy fine sand. Diuron appeared to breakdown most readily at 35C. Cyanazine was usually decomposed by the 10th week at 5C and the 5th week at higher temperatures.
W79-02909

ATRAZINE PERSISTENCE IN A VALENTINE LOAMY FINE SAND PROFILE,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W79-02910

A CHEMICAL MODEL OF HEAVY METALS IN THE GREAT SALT LAKE,
Utah Agricultural Experiment Station, Logan.
A. E. Van Luik, and J. J. Jurinak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 557, Price codes: A08 in paper copy, A01 in microfiche. Research Report 34, June 1978, 155 p, 14 tab, 8 fig, 71 ref, 2 append. OWRT A-038-UTAH(1), 14-34-0001-8047.

Descriptors: *Heavy metals, Brines, Sediments, Lead(Element), Cadmium, *Utah, *Path of pollutants, Trace elements, Model studies, Toxic metals, Water pollution sources, *Great Salt Lake(Utah), Brine-sediment exchange.

The objective was to provide quantitative information for management decisions in dealing with toxic heavy metal inflows into a salt water body. The method was to develop a model to describe the chemistry of these trace metals in highly concentrated electrolyte solutions (Great Salt Lake brine). This was accomplished by expanding an existing model based on the cluster integral expansion theory of electrolyte solution structure into a comprehensive thermodynamic model describing the equilibrium chemistry of the major and minor components of brines, including heavy metals present in trace amounts. The model receives molar ion concentrations, pH, and temperature as input data. Solution density, water content, and total solute content are computed internally to express the molar input data in terms of equivalents per kilogram of solvent, which is the internal working unit for concentration. The internal supporting routines for the otherwise completely general model restrict the applicability of this model to sodium chloride dominated brines of ionic strengths from 2 to 6 molal. Temperature compensations were included to make the model applicable to solutions from 10 to 35 degrees centigrade. Other existing models have been shown applicable to more dilute solutions. The model was applied to predict the solubility of copper, lead, cadmium and zinc in samples taken from the north arm of the Great Salt Lake.
W79-02913

PCBS INVOLVEMENT IN THE PULP AND PAPER INDUSTRY,
R. A. Carr, G. Y. Contos, R. L. Durfee, C. C. V. Fong, and E. G. McKay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 017, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 506/6-77-005, Versar Inc., Final Task Report 474-5A, 110 p, February 25, 1977.

Descriptors: *Polychlorinated biphenyls, *Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Waste water(Pollution), Costs, Waste water treatment, Pollutants, Water pollution treatment, Pulp wastes, Effluents, Carbonless paper.

Sources, distribution, and losses of PCBs in the U.S. pulp and paper industry are discussed. The major source was recycled carbonless copy paper manufactured from 1957 to 1971, but amounts of PCBs from this source diminished rapidly after 1971. A model showing past and projected PCB contents in paper products and waste waters is presented and discussed. Costs for effluent treatment to achieve 1 ppb of PCB in industrial effluents (under worst conditions) are estimated, indicating that such treatment will increase product costs by 3-5%. (Brown-IPC)
W79-02920

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE NEW YORK BIGHT, FIRST AND SECOND MONITORING CRUISES, NOVEMBER 1975 AND MARCH 1976,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5C.
W79-02922

CHEMICAL LIMNOLOGY OF GEORGIAN BAY, 1974,
Department of Fisheries and Environment, Burlington (Ontario). Water Quality Branch
For primary bibliographic entry see Field 5A
W79-02923

CHEMICAL SEWAGE SLUDGE DISPOSAL ON LAND (LYSIMETER STUDIES) VOLUME II,
Department of Fisheries and Environment, Ottawa (Ontario). Wastewater Technology Centre; and Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5E
W79-02924

AN APPRAISAL OF THE HYDROGEOLOGICAL PROCESSES INVOLVED IN SHALLOW SUBSURFACE RADIOACTIVE WASTE MANAGEMENT IN CANADIAN TERRAIN,
Department of Fisheries and Environment, Ottawa (Ontario). Water Resources Branch.
G. E. Grisak, and R. E. Jackson.
Scientific Series No. 84, 1978, 194 p., 54 fig., 282 ref., 28 tab.

Descriptors: *Hydrogeology, Geology, *Radioactive wastes, *Management, *Subsurface drainage, *Terrain analysis, Appraisals, Nuclear energy, Groundwater, Liquid wastes, Velocity, Hydrologic aspects, Conductivity, Canada, *Chalk River, *Bruce, *Whiteshell, *Suffield, Ontario, Manitoba, Saskatchewan.

The Hydrogeological aspects of the problem of low-level radioactive waste management are introduced with a discussion of the Canadian nuclear power program; the nature of radioactive wastes and their rates of production; and the half-lives and health affects of 'waste' radionuclides. As well, a general account is given of the present Canadian policy and procedures for licensing radioactive waste management sites. Following this introductory material, a detailed account is presented of the geohydrologic processes controlling the transport of radionuclides in gfoundwater flow systems and the attendant geochemical processes causing the retardation of the radionuclides. These geohydrologic and geochemical processes (i.e., hydrogeological processes) can be evaluated by the measurement of certain variables such as aquifer dispersivity, groundwater velocity, hydraulic conductivity, cation-exchange capacity, and total competing cations. To assess the possible importance of each variable in Canadian terrain, a comprehensive discussion of presently available (Canadian) data that have been compiled pertaining to each variable is presented. A description is then given of the hydrogeology of and the waste management experiences at radioactive waste management sites at Chalk River, Ontarion; Bruce, Ontario; Whiteshell, Manitoba; and Suffield, Alberta. Along with this description there is a brief evaluation of those geohydrologic and geochemical processes that may be of importance at these sites. (WATDOC)
W79-02926

CONTRIBUTION OF CHRONIC PETROLEUM INPUTS TO NARRAGANSETT BAY AND RHODE ISLAND SOUND SEDIMENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. S. Van Vleet, and J. G. Quinn.
Rhode Island University Marine Reprint No. 112. Reprinted from: Journal of the Fisheries Research Board of Canada, Vol 35, no 5, p 536-543. 1978. 2 fig, 3 tab, 29 ref. SG-04-80M01-147.

Descriptors: *Sediments, *Water pollution sources, *Municipal wastes, *Oil pollution, Estuaries, Coasts, Rhode Island, Hydrocarbons, Petroleum hydrocarbons, Narragansett Bay, Gulf of Maine, Biogenic hydrocarbons, Crude oil.

Sediment cores from Narragansett Bay and Rhode Island Sound have been analyzed for petroleum hydrocarbons and compared with a relatively unpolluted sediment core from the Gulf of Maine. The sediments were analyzed for unbound hydrocarbons, hydrocarbons bound or closely associated with humic substances, and residual hydrocarbons bound or closely associated with the clay mineral or kerogen matrix. Results indicated that in general 90-100% of the hydrocarbons were in the unbound form and could be easily extracted with organic solvents. The petroleum hydrocarbons decreased with depth at all stations. Biogenic hydrocarbons made up an increasingly greater percentage of the total with increasing depth. The hydrocarbons in the Narragansett Bay sediments and near surface Rhode Island Sound sediments strongly resembled the hydrocarbons previously reported for the Providence River and upper Narragansett Bay. These petroleum-like hydrocarbons were shown to be largely introduced to the river and bay through chronic inputs from a municipal wastewater treatment plant. These hydrocarbons then undergo sedimentation throughout the entire bay and into Rhode Island Sound. Preliminary calculations indicate that over 0.2 million t (tonne) of petroleum hydrocarbons may be transported to the marine environment annually from municipal treatment plants. (NOAA)
W79-02942

AN EXPOSURE SCALE FOR MARINE SHORES IN WESTERN NORWAY,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
D. H. Dalby, E. B. Cowell, W. J. Syratt, and J. H. Crothers.
Journal of the Marine Biological Association of the United Kingdom, Vol. 58(4), 1978, p. 975-990, 2 tab., 5 fig., 33 ref.

Descriptors: *Monitoring, *Atlantic Ocean, Oil, Oil pollution, Oil spills, *Methodology, Industrial wastes, Molluscs, Waves(Water), Fjords, *Bioindicators, North Sea, Lichens, Biological communities, *Rocky shore, Exposure scale, Fensfjord area, Western Norway, Oil refineries, Nucella, Norwegian coast, Black Lichen Zone, Specie abundance curves.

A rock shore exposure scale, intended primarily for use in biological monitoring sites in the Fensfjord area, Western Norway, has been prepared. This scale is developed from an earlier scale devised for Milford Haven, Wales, making use of species abundance curves along the wave exposure gradient. Independent evidence for the validity of the scale is provided by shell shape variation in Nucella lapillus and by the height of the black lichen zone in the supralittoral fringe. The successive steps in the preparation of the scale are outlined, definitions of the exposure grades are given in tabular form for the restricted set of species analysed numerically and descriptions are provided in an extended form to provide a fuller picture for users of the scale. It is believed that the scale will prove applicable to other rocky shores around the Noth Sea. (EIS-Katz)
W79-02964

ACCELERATED RATE OF ALBINISM IN CHANNEL CATFISH EXPOSED TO METALS,
Thomas Hunt Morgan School of Biological Sciences, Lexington, KY.
For primary bibliographic entry see Field 5C.
W79-02967

DISCHARGE OF SOLIDS FROM FISH PONDS,
Fish Farming Experimental Station, Stuttgart, AR.
J. E. Ellis, L. T. Dewey, and R. R. Carter.
The Progressive Fish Culturist, Vol. 40(4) 1978. p. 165-166. 1 tab., 4 ref.

Descriptors: *Aquiculture, Fish establishment, *Fish farming, Fish handling facilities, *Fish hatcheries, Fish management, Fish ponds, Biomass, Fish populations, *Animal wastes(Wildlife), Suspended solids, Waste treatment, Waste water, Sources of pollution.

Water samples were collected from effluents of fish ponds and analyzed for setteable, nonsetteable, and suspended solids. Fish biomass in ponds was not consistently associated with amounts of setteable or nonsetteable solids, but was correlated with amounts of suspended solids. The amount of solids discharged was relatively small, suggesting little or no pollution of receiving waters. (EIS-Katz)
W79-02970

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS. SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Lab., Delft (Netherlands) and Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
For primary bibliographic entry see Field 2L.
W79-02983

A MEASURE OF RESPONSE TO PERTURBATION USED TO ASSESS STRUCTURAL CHANGE IN SOME POLLUTED AND UNPOLLUTED STREAM FISH COMMUNITIES,
Delaware Univ., Newark. Dept. of Biological Sciences.
H. Cornell, L. E. Hurd, and V. A. Lotrich.
Oecologia, Vol. 23, p. 335-342, 1976. 1 fig., 2 tab., 10 ref.

Descriptors: Mathematical studies, *Statistical methods, *Biological communities, Sampling, Dominant organisms, Bioindicators, Water pollution, Water pollution effects, Sedimentation, Silting, Freshwater fish, Tagging methodology, *Stream fisheries, *Diversity index, Evenness, *Index of change.

A new method for measuring structural change in sets of species which have been subjected to natural or exprimental perturbation is developed and is shown to be superior to static diversity and evenness measures for this purpose. Three parameters, are shown to provide necessary and sufficient information on the severity of a perturbation as well as the uniformity of its effect on all species in the set. When positive and negative changes in species abundance are considered separately, the method is sensitive to compensatory changes which are not detected by static measures. The parameters are then calculated for some data sets on polluted and unpolluted fish communities in second and third order streams from the Clemons Fork watershed in eastern Kentucky. Results indicate that the diversity of change over two sampling seasons is high for perturbed and unperturbed systems, but the evenness of change is lower for the communities which were polluted in the second sampling season. Several pollution results in the suppression of most major fish species, whereas more moderate pollution results in a large number of compensatory changes. The biological basis for such an outcome is discussed, and the notion of these three parameters as the 'vital signs' of a healthy ecosystem is presented. (Katz)
W79-02996

5C. Effects Of Pollution

A REPORT ON THE CONCENTRATION, DISTRIBUTION AND IMPACT OF CERTAIN TRACE METALS FROM SEWAGE TREATMENT PLANS ON THE CHESAPEAKE BAY,
Chesapeake Research Consortium, Inc., Annapolis, MD.
For primary bibliographic entry see Field 5B.
W79-02511

DETERMINATION OF THE PRACTICAL VALUE OF TOXIC LOADINGS,
British Columbia Research Council, Vancouver. Canadian Environmental Protection Service, Ottawa, Ontario K1A 1C8, Cooperative Pollution Abatement Research (CPAR) Project Report 588-1, April, 1977, 38 p. 2 fig, 6 ref, 11 tab.

Descriptors: *Pulp wastes, *Toxicity, Acid streams, Alkaline water, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Canada, Foreign countries, Effluents, Waste water(Pollution), Mixing.

The additive nature and mixing patterns of toxic loadings in alkaline and acid sewers of bleached kraft mills were investigated at two British Columbia locations (Powell River and Harmac) of MacMillan Bloedel Ltd. Results indicated that the toxicity of different process streams making up the individual acid and alkaline sewers is additive when expressed in terms of toxicity emission rates or toxic loadings per ton of pulp. On the other hand, when the acid and alkaline sewers were combined into total mill effluent, their toxicities were less than additive. The procedure by which the two streams were mixed did not have any effect on the combined effluent's toxicity. (Brown-IPC)
W79-02536

WATER QUALITY ASSESSMENT MODEL - OXYGEN DYNAMICS MODEL FOR LOW-FLOW STREAMS,
Civil and Environmental Engineering Development Office, Tyndall AFB, FL.
For primary bibliographic entry see Field 5B.
W79-02579

SUPPLEMENT TO 'EFFECTS OF THERMAL DISCHARGES ON PHYSICO-CHEMICAL PROCESSES AND WATER QUALITY' VISTULA RIVER, POLAND,
Institute of Meteorology and Water Management, Warsaw (Poland).
J. R. Dojlido.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 580, Price codes: A08 in paper copy, A01 in microfiche.

Environmental Protection Agency, Report EPA 600/3-77-074b, November, 1977. 147 p, 130 tab, 6 ref.

Descriptors: *Thermal effects, *Water temperature, On-site-investigation, Water pollution effects, Streams, Electric power, *Thermal pollution, Thermal power, Thermal powerplants, *Thermal water monitoring, Cooling water, *Particle size, Sediments, Chemical analysis, Water quality, *Vistula River, Poland, Kozienice Power Plant.

The study on the influence of thermal water discharge from the open cooling system of the Kozienice power plant on the thermal regimes and water quality of the Vistula River was carried out in the period from January 1973 to December 1975. The plant, situated at the 425th km of the Vistula River, first started in November 1972. Construction was finished in February 1975 with 1600 MWe capacity. Studies carried out downstream of the plant included: (1) expedition type of survey, the temperature and velocity distributions in chosen cross-sections of the river and in the outlet channel were done. (2) periodical type of survey. The temperature and velocity distribution in the cross-section 1000 m downstream of the discharge and in the outlet channel. (3) everyday observations of the temperature in the three cross-sections at three points in each both banks and midstream at 7 a.m., 12 noon and 6 p.m. Special investigations were performed using a Coulter Counter to determine the influence of thermal water discharge on the number and size distribution of suspended particles in Vistula water. This report contains basic data collected in these studies and a section on Precision of Analytical Methods. (EIS-Katz)
W79-02581

CONCENTRATIONS OF TEN HEAVY METALS IN SOME SELECTED LAKE POWELL GAME FISHES,
New Mexico Univ., Alburguerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W79-02582

AN ASSESSMENT OF THE OCCURRENCE OF HUMAN VIRUSES IN LONG ISLAND AQUATIC SYSTEMS,
Brookhaven National Lab., Upton, NY.
J. M. Vaughn, and E. F. Landry.
Report BNL 50787 130 p., 1977. 29 fig, 45 tab, 106 ref.

Descriptors: *Viruses, *Public health, *Sewage treatment, Human pathology, Human diseases, Chlorination, Municipal wastes, Water analysis, Sewage effluents, Waste water disposal, Pollutant identification, Secondary treatment, Tertiary treatment, *Poliovirus, *Enteroviruses.

The survey involved the concentration, enumeration, and identification of human enteroviruses from selected aquatic systems on Long Island including embayments, lakes, creeks, public drinking water supplies, groundwater influenced by wastewater recharge, sanitary landfills, and stormwater recharge basins; and the effluents from secondary and tertiary sewage treatment plants. Enteroviruses were isolated from all systems studied except the public water supply wells. As expected, viruses were most often encountered in the chlorinated effluents of sewage treatment plants. On two separate occasions, wild type Poliovirus was isolated from one of these plants. (EIS-Deal)
W79-02584

THE USE OF POTASSIUM PERMANGANATE (KMNO4) IN FISHERIES; A LITERATURE REVIEW,
Fish and Wildlife Service, Fayetteville, AR. South Central Reservoir Investigations.
For primary bibliographic entry see Field 5G.
W79-02585

SENSITIVITY OF MACROCYSTIS GAMETOPHYTES TO COPPER,
California Univ., Livermore. Lawrence Livermore Lab.
B. M. Smith, and F. L. Harrison.
Lawrence Livermore Laboratory, Technical Information Department, UCRL-52481, 38 p, 1978. 16 fig, 22 tab, 51 ref.

Descriptors: *Copper, *Kelps, *Toxicity, Bioassay, Growth stages, Growth rates, Plant growth, Plant physiology, Resistance, Reproduction, Biological membranes, Water chemistry, Water analysis, Chemical analysis, *Macrocystis, Gametophytes.

Gametophytes of giant kelp, Macrocystis pyrifera, were exposed to copper in a dish-culture bioassay system. Through their development into gametophytes, newly released spores were exposed continuously to various concentrations of copper to determine its effect on vegetative growth. In addition, gametophytes of different ages were exposed continuously to copper to determine the sensitivity of several developmental stages to copper and the effect of copper on the production of gametes. A one-week pulsed-exposure experiment was performed to determine the recovery period for vegetative growth. Complete inhibition of growth occurred when gametophytes were exposed continuously to copper concentrations of 500 ppb or more. Vegetative growth was inhibited significantly by continuous exposure to 50 ppb copper. (EIS-Deal)
W79-02586

THE EFFECT OF ARSENIC ON THE THERMAL TOLERANCE AND SURVIVAL OF NEWLY HATCHED MUSKELLUNGE FRY (ESOX MASQUINONGY),
State Univ. of New York at Buffalo. Dept. of Biology.
F. V. Paladino.
Master's Thesis, Department of Biology, State University of New York at Buffalo, 35 p, 1976. 11 fig, 8 tab, 37 ref.

Descriptors: *Resistance, *Water temperature, *Pikes, *Sodium arsenite, Arsenic compounds, Toxicity, Mortality, Fish physiology, Fry, Water pollution effects, Herbicides, Pesticide toxicity, Pesticide residues, Water quality, Bioassay, *Arsenic, Thermal pollution.

Newly hatched muskellunge fry were raised in tanks containing 0.00, 0.05, 1.0 and 5.0 ppm arsenic as sodium arsenite at a temperature of 15C (+ or - 0.5C) and a photoperiod of 12 hours of light alternating with 12 hours of dark. Temperature tolerance of fry, Critical Thermal Maximum, (CTM), was significantly reduced by exposure to arsenic. Fry raised at arsenic concentrations of 0.05 ppm or greater suffered 100% mortality during or shortly after swim-up. Control fry had a sharp drop in CTM during swim-up, became active feeders and continued to develop normally. (EIS-Deal)
W79-02587

DIVERSITY AS A MEASURE OF BENTHIC MACROINVERTEBRATE COMMUNITY RESPONSE TO WATER POLLUTION,
State Univ. of New York Coll. at Oneonta. Dept. of Biology.
P. J. Godfrey.
Hydrobiologia, Vol. 57, No. 2, p 111-122, 1978. 4 fig, 5 tab, 36 ref. OWRT B-004-MASS(8), 14-01-0001-1510.

Descriptors: *Bioindicators, *Stream pollution, *Benthic fauna, *Aquatic invertebrates, Water pollution effects, *Diversity indices.

The assumption that water pollution causes a depression in the diversity of benthic macroinvertebrates as measured by the Shannon index and similar diversity indices is questioned. An interpretation of the community response of benthic macroinvertebrates to pollution in the Millers River, Massachusetts is developed from species presence-absence and abundance data in conjunction with published information on the species' environmental tolerances as compared to chemical water quality data. This interpretation is compared with one derived solely from diversity index values. The interpretations are quite different; the differences may be attributed to other environmental factors such as impoundments and flow reduction which influence the fauna and thus the diversity index value, but which are not related to pollution. In addition, several intrinsic features of the diversity indices increase their bias.
W79-02595

AVIAN COMMUNITIES AND HABITAT COMPONENTS IN NATURAL AND WASTEWATER-IRRIGATED ENVIRONMENTS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5G.
W79-02601

METHODOLOGY DEVELOPED FOR ASSESSMENT OF FISH AND MACROINVERTEBRATE COMMUNITIES IN THE NEW RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Botany.
C. H. Hocutt.
Available from Univ Microfilms International, Ann Arbor, MI 48106; Order No. 74-23,811. PhD Thesis, 1974. 189 p.

Descriptors: *Aquatic populations, *Invertebrates, *Sampling, *Rotenone, *Benthic fauna, *Thermal pollution, *Statistical methods, *Analytical techniques, *Methodology, *Fish, Water pollution effects, Water pollution sources, Heated water, Biological communities, Stress, Environmental effects, *Shaerotilus natans, *New River(Virginia).

Techniques developed or refined for collecting and evaluating fish and macroinvertebrate data from the New River, Virginia, are reported. These methods were developed to allow accurate ecological assessment of large river systems. Techniques were refined for sampling fish by rotenone and macroinvertebrates by artificial substrates. Chemical and biological data indicated that Celanese had a local effect on New River due to high discharge temperatures. (Katz)
W79-02606

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. INTERIM SYNTHESIS: BEAUFORT/CHUKCHI.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
NOAA/ERL/OCSEAP, Arctic Project Office, Interim Synthesis Report: Beaufort/Chukchi, August 1978. 369 p.

Descriptors: *Water pollution effects, *Resources development, *Baseline studies, *Oil pollution, *Environmental effects, Aquatic live, Arctic, Cold regions, Ice, *Outer Continental Shelf, Beaufort Sea, Chukchi Sea, Petroleum development.

Twelve baseline studies are compiled providing information on: The Sea Ice Environment; Physical Oceanography and Meteorology; Earth Sciences; Marine Mammals; Birds; Marine Biota; Chemistry and Microbiology; Species, Habitats and Processes Sensitive to OCS Development; Trophic Interactions; Probable Impacts and Consequences of Oil Development; Effects of Gravel mining and Construction of Gravel Islands and Causeways; and Environmental Hazards to Offshore Operations of the Beaufort and the Chukchi Seas before the development of petroleum and related resources were undertaken. (See W79-02609 thru W79-02613) (Sinha-OEIS)
W79-02608

SPECIES, HABITATS AND PROCESSES SENSITIVE TO OCS DEVELOPMENT,
Environmental Research Lab., Fairbank. AK. Arctic Project Office.
In: Environmental Assessment of the Alaskan Continental Shelf. Interim Synthesis Report: Beaufort/Chukchi. Part II, Interdisciplinary Aspects of Likely OCS Impacts, August 1978. p 251-267, 1 fig, 1 tab. P. Connors, (ed.).

Descriptors: *Resources development, *Water pollution effects, *Environmental effects, *Aquatic life, Habitats, Ecosystems, Baseline studies, Alaska, *Outer Continental Shelf, *Environmental assessment, Petroleum development, Beaufort Sea.

The Alaskan Beaufort seacoast is a mosaic of marine, shoreline and tundra habitats distributed over a length of several hundred kilometers. Some habitats, such as saltmarsh, are very important to wildlife and are easily damaged by OCS development, but are limited in areal extent and are dispersed in many small patches along the coast. Different sensitivity ratings are assigned to a list of habitats and the seasonal variations in sensitivity within each habitat is noted. Under the separate discussion of key biota, species are listed which merit special attention in research and management. These are chosen for a variety of reasons, including high population concentrations along the Beaufort coast, vulnerability to potential disturbances such as oil spills, scarcity in North America, or importance to humans for subsistence use. See also W79-02608. (Sinha-OEIS).
W79-02609

TROPHIC INTERACTIONS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
In: Environmental Assessment of the Alaskan Continental Shelf Interim Synthesis Report: Beaufort/ Chuchi. Part II, Interdisciplinary Aspects of Likely OCS Impacts, August 1978. p 268-287, 33 ref. Frost, K. (ed.).

Descriptors: *Environmental effects, *Trophic level, *Ecosystems, *Arctic, Alaska, Oil spills, Water quality control, Baseline studies, *Outer Continental Shelf, Trophic interactions, Petroleum development, Beaufort Sea.

The trophic interactions of the food web in the Beaufort Sea and the potential environmental impacts of petroleum exploration and development on this ecosystem are examined. Not only are arctic organisms different from temperate ones, but so is the behavior of oil in cold arctic waters, and in the presence of ice. Identification of key species and important species interdependencies will make it easier to develop predictive models or to assess ecological effects. Trophic studies are a means of ordering and simplifying systems, of reducing them from lists of hundreds of species of smaller sets of key species and interactions. The study of trophic interactions within a system can identify potential differential sensitivity of parts of the system, evaluate which times or places or species appear to be most or least vulnerable, and make recommendations as to how to minimize potential detrimental effects of OCS development. (See also W79-02608)(Sinha-OEIS)
W79-02610

PROBABLE IMPACTS AND CONSEQUENCES OF OIL DEVELOPMENT,
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
In: Environmental Assessment of the Alaskan Continental Shelf Interim Synthesis Report: Beaufort/ Chukchi. Part II, Interdisciplinary Aspects of Likely OCS Impacts, August 1978. p 288-320, 36 ref. Burns, J. J. (ed.).

Descriptors: *Habitats, *Biota, *Oil spills, *Arctic, Alaska, Baseline studies, Environmental effects, Cold regions, *Outer Continental Shelf, *Environmental impact, Beaufort Sea, Petroleum development.

Two sections, one on sensitive species and habitats and another on trophic interactions, have been singled out for separate discussion. The object was to reexamine and reevaluate predictions of the possible consequences of hypothetical situations which would probably occur during development of the Beaufort Sea. This working group was concerned with attempting to recognize and discuss those species, geographical areas and habitats considered to be sensitive or critical. Thus, if a species of animal is considered sensitive, its sensitivity is to oil spills, disturbance, dislocation or other impacts generated by the processes of exploration, development or production of gas and oil fields. The animal could be adversely affected while the capability of its habitat to support that animal remains essentially unchanged. 'Sensitive areas' are considered to be those in which biological productivity is relatively high and which would probably be adversely impacted by major disturbances, particularly oil spills. Adverse impacts in a significant portion of a sensitive area would result in a 'critical impact' to one or more species of plant or animal. (See also W79-02608) (Sinha-OEIS)
W79-02611

EFFECTS OF GRAVEL MINING AND CONSTRUCTION OF GRAVEL ISLANDS AND CAUSEWAYS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
In: Environmental Assessment of the Alaskan Continental Shelf Interim Synthesis Report: Beaufort/ Chukchi. Part II, Interdisciplinary Aspects of Likely OCS Impacts, August 1978. p 321-334, 16 ref. Hopkins, D. M. (ed.).

Descriptors: *Resources development, *Mining, *Environmental effects, Gravels, Drilling, Exploration, Arctic, Alaska, Cold regions, Baseline studies, *Outer Continental Shelf, *Artificial islands, Beaufort Sea, Petroleum development, Environmental assessment.

With proper design and scheduling, many of the natural islands of the Beaufort Sea could be used for exploratory and developmental drilling and as production sites with low negative environmental consequences. Certain islands (western Cooper, Cross, Duck, and Howe Islands) which are important nesting habitats, should be kept untouched. Historical and archaeological sites should be inventoried and protected before use of the tundra-covered Pleistocene islands is permitted. Causeways may cause more serious perturbations of the environment. However, in spite of their disadvantages, a causeway could prove extremely useful in limiting the dispersal of oil during a major spill event. Dismantling and removal of artificial islands and causeways may create as much environmental disturbance and involve at least as much cost as the original construction. Biota may have become dependent on the causeways and artificial islands and serious consideration should be given to leaving in place those structures that do not pose serious hazards to navigation, with or without their slope protection. A few artificial islands and causeways can be constructed in appropriate places without severe adverse consequences, but the lacing of the 1979 lease area with multiple artificial islands, stabilized natural islands, and interconnecting causeways could have disastrous cumulative effects upon the biota of this arctic region. (See also W79-02608) (Sinha-OEIS)
W79-02612

ENVIRONMENTAL HAZARDS TO OFFSHORE OPERATIONS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
In: Environmental Assessment of the Alaskan Continental Shelf Interim Synthesis Report: Beaufort/ Chukchi. Part II, Interdisciplinary Aspects of Likely OCS Impacts, August 1978. p 335-362, 1 fig. Weeks, W.F. (ed.).

Descriptors: *Resources development, *Hazards, *Cold regions, *Offshore platforms, Environmental effects, Baseline studies, Alaska, Ice, *Outer Continental Shelf, Beaufort Sea, Petroleum development, Environmental assessment.

A number of areas have been discussed in which the environment can have a significant impact on offshore operations along the Beaufort Sea coast. If the nature of the environmental hazard is understood and incorporated into the initial design and subsequent operation of a system, safe and efficient operation can certainly be achieved although at times the price will be high. The Beaufort Sea is a frontier area in the sense that many of the environmental problems encountered there, in particular those associated with the presence of ice, are different from the problems that are usually encountered in petroleum development of an ice-free coast. There is, however, operation experience that has been gained in other areas where ice is common, such as the Canadian Arctic and Cook Inlet, and it is directly applicable to the Beaufort Sea coast. Good design for this challenging region will definitely require a thorough knowledge of environmental hazards and sea ice mechanics coupled with solid inventive engineering. (See also W79-02608) (Sinha-OEIS)
W79-02613

EFFECTS OF BUNKER C OIL AND AN OIL DISPERSANT: PART 2--EFFECTS ON THE ACCUMULATION OF CHLORINE-LABELLED BUNKER C OIL IN VARIOUS FISH TISSUES,
Simon Fraser Univ., Brunaby. (British Columbia). Dept. of Biological Sciences.
B. A. McKeown, and G. L. March.
Marine Environmental Research, Vol 1, No 2, p 119-123, October 1978. 1 fig, 9 ref.

Descriptors: *Water pollution effects, *Oil pollution, Fish, Environmental effects, Laboratory tests, *Outer Continental Shelf, *Bunker C oil, Dispersants, Hydrocarbons.

Chlorine-labelled Bunker C oil was used to measure the differential accumulation in various fish tissues between a hydrocarbon and a hydrocarbon/ oil dispersant mixture. There is an increased movement of the emulsified oil across the gill structure although accumulation by this tissue is similar for both test conditions. The liver and kidney showed significantly higher levels of the oil/dispersant mixture whereas muscle accumulations were less dramatic. The amounts of Bunker C found in the gills, liver and kidney were considerably higher than that found in the muscle. Consideration was given to the varying capability of the blood to carry polar, compared with non-polar, compounds. (Sinha-OEIS)
W79-02620

EXPERIMENTS WITH LITTORINA SPECIES TO DETERMINE THE RELEVANCY OF OIL SPILL DATA FROM SOUTHERN CALIFORNIA TO THE GULF OF ALASKA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
D. Straughan, and D. Hadley.
Marine Environmental Research, Vol 1, no 2, p 135-163, October 1978. 12 fig, 9 tab, 18 ref.

Descriptors: *Oil spills, *Toxicity, *Mortality, *Water pollution effects, Environmental effects, Alaska, Canada, California, Laboratory tests, Temperature, *Outer Continental Shelf, Littorina scutulata, Littorina sitkana, Petroleum, Gasoline.

Littorina scutulata were collected from Alaska, Canada and southern California and L. sitkana were collected from Alaska and Canada. These animals were exposed to a range of petroleums at a range of temperatures. Gasoline was the most toxic of all compounds tested. Six degrees C and 29C temperatures both during and prior to experiments had a greater influence on survival and attachment rates a week after exposure to petroleum than did the different types of petroleum. The temperature influence can be related to both zoogeographical distribution and seasonal temperatures. Data obtained in the Santa Barbara Channel can be extrapolated to the Gulf of Alaska when differences such as temperature tolerance and type of oil are considered for the same and closely related species. Attachment rates and mortality rates changed after the animals were removed from petroleum. This suggests a weakness in standard toxicity testing procedures when mortality rates are compared immediately after removal from test solutions. (Sinha - OEIS)
W79-02621

CULTURING AND ECOLOGY STUDIES OF THE ROTIFER POLYARTHRA VULGARIS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. L. Bukema, J. Cairns, Jr., P. C. Edmunds, and T. H. Krakauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 587, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/3-71-051 August 1977. 53 p, 16 tab, 7 fig, 91 ref.

Descriptors: *Zooplankton, *Methodology, *Rotifers, *Laboratory tests, Laboratory equipment, Oxygen, Vitamins, Animals, Fish food organisms, Water temperature, Stress, Oxygen, Animal growth, Animal diseases, Animal physiology, Reproduction, Animal population, Chlorophyll, *Polyarthra vulgaris.

The results contained in this report represent research conducted to identify variables which affect the survival and reproduction of the rotifer, Polyarthra vulgaris. The following variables were studied: handling stress, container size, frequency of changing the culture medium, light quantity and quality, photoperiod, oxygen and vitamin requirements, fungal parasites, food preference and concentration, antibioic effects of bluegreen algae, and temperature. Temperature had an effect on population dynamics, percent of females with eggs, number of eggs per female, and sexual reproduction. Egg production rates were estimated and observations on the duration of egg development were made. This report also includes a field study of the relation between Polyarthra vulgaris and 19 selected chemical and physical parameters. (EIS-Katz)
W79-02624

DESIGN AND EVALUATION OF LABORATORY ECOLOGICAL SYSTEM STUDIES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
C. E. Warren, and W. J. Liss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 051, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-022, December 1977, 116 p, 1 tab, 31 fig, 51 ref.

Descriptors: *Toxicity, *Bioassay, *Mathematical models, Environment, Ecology, Aquatic biology, *Aquatic populations, *Laboratory tests, Water pollution, Water pollution effects, Laboratory equipment, Microcosms, Biological systems, Laboratory ecological systems, Toxicant effects, *Theoretical analysis, Environmental toxicology, Bioassays.

Design and evaluation of laboratory ecological system studies are considered in relation to problems and objectives in environmental toxicology. Ecological systems are defined to be organismic systems together with their level-specific, co-extensive environmental systems and to occur at individual, population, and multispecies levels of biological organization. So that the basis for judgments on the relevance and adequacy of laboratory ecological system studies for solution of problems in environmental toxicology will be clear, a conceptual framework defining with abstract generalizations the nature of biological systems is presented and employed. And a graphical calculus is used to deduce isocline systems and dynamic as well as steady-state behaviors of multispecies systms, so as to illustrate the importance of empirical evaluation of the capacities, not simply the performances, of laboratory ecological systems. Within the context of apparent toxicological problems and this conceptual framework, the relevance and adequacy of laboratory ecological system studies on toxicant effects and behaviors are evaluated. ((EIS-Katz)
W79-02625

FEASIBILITY OF USING BACTERIAL STRAINS (MUTAGENESIS) TO TEST FOR ENVIRONMENTAL CARCINOGENS,
Houston Univ., TX. Dept. of Biology.
J. E. Evans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 672, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-600/3-78-042, 118 p, April 1978. 7 tab, 79 ref, 4 append.

Descriptors: *Toxicity, *Bacteria, *Chemical wastes, Industrial wastes, Chemicals, Organic compounds, Hazards, Animal pathology, Human pathology, Bioassay, Physicochemical properties, E. coli, Salmonella, Aromatic compounds, Dyes, Laboratory tests, Path of pollutants, Bioindicators, *Mutagens, *Carciongens.

A rapidly growing store of data is available relative to the potential mutagenicity and carcinogenicity of new products of chemical substances manufactured for commerce in recent years. Literature regarding mixtures, such as chemical wastes, however, is scarce and hard to find. A literature review was undertaken to assess feasibility of using bacteria as screening agents to detect environmental carcinogens. Mutagenicity data were included in the study because growing experimental evidence indicates that most chemical carcinogens are mutagens, and many mutagens may be carcinogens. This investigation found that bacterial mutagenesis can be used to initiate a series of studies designed to screen for potential mutagens and carcinogens in mixed chemical wastes. (EIS-Deal)
W79-02626

BIOLOGICAL AVAILABILITY OF POLLUTANTS TO MARINE ORGANISMS,
Center for Energy and Environment Research, Mayaguez, Puerto Rico.
J. R. Montgomery, M. Price, J. Thurston, G. L. de Castro, and L. L. Cruz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 187, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/3-78-035, 145 p, March 1978. 43 fig, 4 tab, 38 ref.

Descriptors: *Trophic level, *Food webs, *Sewage sludge, *Sludge disposal, Cadmium, Chromium, Copper, Nickel, Lead, Zinc, *Heavy metals, Clams, Oysters, Snails, Sewage disposal, Path of pollutants, Public health, Absorption, *Sea urchin, Thalassia, *Sea cucumber, *Mangrove, Tissue analysis, Bioaccumulation.

This research was initiated to determine the rates of uptake, by a Thalassia testudinum ecosystem, of Cd, Cr, Cu, Ni, Pb, and Zn which were leached from sewage sludge by seawater. Organisms utilized in the study were: clam; oyster; snail; sea cucumber; uchin; turtle grass; and red mangrove. In general, the net uptake pathways followed the trophic levels in the food webs. The authors concluded that the dumping of sewage sludge in shallow, tropical marine environments could lead to high concentrations of toxic metals inorganisms used as food by man. (EIS-Deal)
W79-02628

AQUATIC FIELD SURVEYS AT HOLSTON ARMY AMMUNITION PLANT, KINGSPORT TENNESSEE, FINAL REPORT,
Water and Air Research, Inc., Gainesville, FL.
J. H. Sullivan, Jr., H. D. Putnam, M. A. Keirn, D. R. Swift, and B. C. Pruitt, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 627, Price codes: A12 in paper copy, A01 in microfiche. Army Research and Development Command, Contract No. DAMD-17-75-C-5049, 267 p, June 1977. 48 fig, 20 tab, 81 ref, 4 append.

Descriptors: *Chemical wastes, *Toxicity, *Periphyton, *Explosives, Aquatic life, Aquatic environment, Biomass, Aquatic algae, Effluents, Trophic levels, Eutrophication, Biological communities, Water quality, Water analysis, Nutrients, *Munitions effluents.

Overall effects of munitions effluents were most clearly observed in the periphytic community and were confined to the vicinity of the waste outfalls. Marked increases in heterotrophic biomass and reduction in autotrophic populations were noted. Species compositions shifts among the diatoms growing on artificial substrates suggested toxic manifestations from munitions related effluents. Effects on the periphyton were observed in water containing as little as 20 microg/l RDX. Direct relationship of RDX residues to biotic response in this system must be discharge, upstream waste inputs, and flow variability make it virtually impossible to closely quantify typical conditions at a given station. (EIS-Deal)
W79-02630

CHRONIC TOXICITY OF CHLORDANE, TRIFLURALIN, AND PENTACHLOROPHENOL TO SHEEPSHEAD MINNOWS (CYPRINODON VARIEGATUS),
EG and G, Bionomics, Pensacola, FL. Marine Research Lab.
P. R. Parrish, E. E. Dyar, J. M. Enov, and W. G. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 269, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-600/3-78-010, 53 p, January 1978. 35 tab, 51 ref, append.

Descriptors: *Toxicity, *Mortality, *Minnows, Pesticides, Pesticide toxicity, Pesticide residues, Organic compounds, Fish physiology, Life history studies, Life cycles, Growth rates, Growth stages, Embryonic growth stage, Fecundities, Fish reproduction, Bioassays, *Toxicity testing, *Chlordane, *Trifluralin, *Pentachlorophenol.

Sheepshead minnows were exposed to three chemicals--chlordane, trifluralin, or pentachlorophenol--in flowing, natural seawater to determine acute and chronic (full life-cycle effects). Mortality of parental fish exposed to mean measured chlordane concentrations greater than or equal to 2.8 microg/l was significantly greater than that of control fish. Exposure to mean measured trifluralin in concentrations of greater than or equal to 9.6 microg/l significantly decreased growth of parental fish. Mortality of parental sheepshead minnows exposed to mean measured pentachlorophenol concentrations greater than 88 microgl was signficantly greater than mortality of control fish. Estimates of the maximum acceptable toxicant concentration of each chemical were provided. (EIS-Deal)
W79-02631

SUBSTITUTE CHEMICAL PROGRAM - INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF METHYL PARATHION.
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 840, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-540/1-75-005, 176 p, February 1975. 4 fig, 29 tab, 45 ref.

Descriptors: *Pesticides, *Pesticide toxicity, *Pesticide kinetics, Pesticide residues, Organic pesticides, Toxicity, Organic compounds, Path of pollutants, Chemical properties, Persistence, Cost-benefit analysis, *Methyl parathion, Substitute chemical program.

Methyl parathion was reviewed for suitability as a substitute chemical for more environmentally dangerous pesticides. The substitute chemical was analyzed in reference to its chemistry, toxicology, pharmacology, and environmental fate and movement, and socioeconomic factors such as use patterns, costs and benefits. (EIS-Deal)
W79-02633

CHEMICAL AND BIOLOGICAL SURVEY OF LIBERTY BAY, WASHINGTON,
Environmental Protection Agency, Seattle, WA Surveillance and Analysis Div
J M Cummins, R R Bauer, R H Rieck, W B Schmidt, and J. R. Yearsley

Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 256, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-910/9-76-029, 132 p, September 1976. 32 fig, 22 tab, 59 ref, 2 append.

Descriptors: *Mercury, *Water quality, *Toxicity, *Oysters, Water pollution sources, Water pollution effects, Embryonic growth stage, Sediments, Metals, Industrial wastes, Domestic wastes, Water quality control, Water quality standards, Commercial shellfish, Cadmium, Chromium, Nickel, Mortality, Animal diseases, *Washington, *Tissue analysis, *Liberty Bay(Wash).

This report summarizes an investigation into the possible causative factors for high oyster mortality in Liberty Bay, Washington. Levels of heavy metals and other possible toxicants in seawater, wastes, sediments, fish and shellfish from regional waters were determined. Sources of pollutants were located and recommendations for improvement were presented. (EIS-Deal)
W79-02634

PREIMPOUNDMENT STUDY LITTLE BLACK CREEK DRAINAGE BASN BLACK CREEK WATERSHED BULLOCH COUNTY, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
H. C. Vick, D. W. Hill, H. A. True, R. J. Brunner, III, and T. O. Bramwell, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 310, Price codes: A06 in paper copy, A01 in microfiche. Report EPA 904/9-77-026, August 1977. 74 p, 20 fig, 11 tab, 6 app, 29 ref.

Descriptors: *Water quality, Impoundments, *Preimpoundment, *Multiple-purpose reservoirs, Reservoir sites, Water analysis, Water chemistry, Nutrients, Eutrophication, Coliforms, Pathogenic bacteria, Domestic wastes, Biochemical oxygen demand, Dissolved oxygen, Watersheds(Basins), *Drainage basins, *Georgia, *Black Creek Watershed(Geo), Bulloch County(Geo).

Water quality studies were performed on this drainage basin to determine preimpoundment conditions and predict the effects of the project. It was concluded that: (1) a dissolved oxygen deficiency would be created; (2) the degree of eutrophication experienced would depend upon the control of nutrient sources; and, (3) fecal coliform levels should decrease sufficiently to allow recreational swimming. (EIS-Deal)
W79-02635

EFFECTS OF CHANNELIZATION OF THE LUXAPALILA RIVER ON FISH, AQUATIC INVERTEBRATES, WATER QUALITY AND FURBEARERS,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
D. H. Arner, H. R. Robinette, J. E. Frasier, and M. H. Gray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 507, Price codes: A04 in paper copy, A01 in microfiche. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Report No. FWS/OBS-76-08, June 1976. 58 p, 8 fig, 27 tab, 24 ref.

Descriptors: *Channel improvement, *Channels, *Dredging, Environmental effects, Productivity, Water quality, Turbidity, Plankton, Channeling, Benthic fauna, Fish populations, Sewage effluents, Bass, Channel catfish, Channel flow, Furbearers, Beavers, *Species diversity, Muskrats.

Biological data collected from July 1973 to January 1976 from an old channelized segment (over 52 years), an unchannelized segment, and a newly channelized segment of the Luxapalila River, Mississippi, and Alabama, revealed that productivity of the old channelized segment has not recovered to the levels exhibited in the unchannelized segment. There were no evident differences in water quality between the three segments except for higher turbidity trends in the newly channelized segment. The number of plankton organisms was higher in the newly channelized segment, possibly due to influence of sewage. Diversity of plankton, macroinvertebrates, and fish was greater in the unchannelized segment than in the channelized segments. The average number/sample of fish and macroinvertebrates was significantly higher in the unchannelized segment. Muskrat and beaver, the species not commonly associated with an aquatic habitat, were far more numerous in the unchannelized segment than in either the old or newly channelized segments. (EIS-Deal)
W79-02636

PROBLEM DEFINITION STUDIES ON POTENTIAL ENVIRONMENTAL POLLUTANTS, IV: PHYSICAL, CHEMICAL, TOXICOLOGICAL, AND BIOLOGICAL PROPERTIES OF BENZENE; TOLUENE; XYLENES; AND P-CHLOROPHENYL METHYL SULFIDE, SULFOXIDE, AND SULFONE.
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
For primary bibliographic entry see Field 5G.
W79-02637

FATE OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) IN THE ENVIRONMENT: SUMMARY AND DECONTAMINATION RECOMMENDATIONS,
Air Force Academy, CO. Dept. of Chemistry and Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-02639

USE OF COMMENSAL PROTOZOA AS BIOLOGICAL INDICATORS OF WATER QUALITY AND POLLUTION,
Wayne State Univ., Detroit, MI. Dept. of Biology.
G. A. Antipa.
Transactions of the American Microscopical Society, Vol 96, No 4 p 482-489, 1977. 3 fig, 22 ref. OWRT A-015-ILL(2).

Descriptors: *Bioindicators, *Indicators, *Protozoa, Infection, *Mollusks, Water pollution effects, Water quality, Endocommensal molluscan ciliated protozoa.

Commensal ciliated protozoa of fresh-water bivalve molluscs were tested for their ability to detect conditions of organic pollution within a small midwestern stream. Data are presented which demonstrate that one of these ciliates, Heterocinetopsis unionidarum, responds rapidly to unfavorable conditions. The further development of sensitive biological indicators and their potential to warn of impending and possibly irreversible environmental change are discussed.
W79-02643

THE EFFECT OF HYPOLIMNION RESERVOIR RELEASES ON FISH DISTRIBUTION AND SPECIES DIVERSITY,
Texas Univ. at Austin. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W79-02670

SATELLITE OBSERVATIONS OF CALCIUM CARBONATE PRECIPITATIONS IN THE GREAT LAKES,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 7B.
W79-02685

LAKE PROCESS MODELS APPLIED TO RESERVOIR MANAGEMENT,
URS Corp., San Mateo, CA.
For primary bibliographic entry see Field 5A.
W79-02716

AN ECOLOGICAL STUDY OF EPIPSAMMIC DIATOMS FROM SEDIMENTS ASSOCIATED WITH JUNCUS ROEMERIANUS IN A NORTHWEST FLORIDA SALT MARSH,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 2L.
W79-02722

THE SALT MARSH VEGETATION OF CHINA POOT BAY, ALASKA,
Rutgers - The State Univ., Newark, NJ. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02744

EFFECTS OF GRASS CARP INTRODUCTION ON MACROPHYTIC VEGETATION AND CHLOROPHYLL CONTENT OF PHYTOPLANKTON IN FOUR FLORIDA LAKES,
Florida State Game and Freshwater Fish Commission, Lake Wales.
For primary bibliographic entry see Field 2H.
W79-02758

PLANT BIOMASS AND NET PRIMARY PRODUCTION ALONG A FLOOD-FREQUENCY GRADIENT IN THE STREAMSIDE FOREST,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
For primary bibliographic entry see Field 2I.
W79-02761

ENVIRONMENTAL PARAMETERS OF THE TENNESSEE RIVER IN ALABAMA: II. PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS,
Alabama Univ., in Huntsville. School of Graduate Studies and Research.
For primary bibliographic entry see Field 5A.
W79-02781

DETOXIFICATION OF METALS BY MARINE BIVALVES: AN ULTRASTRUCTURAL STUDY OF THE COMPARTMENTATION OF COPPER AND ZINC IN THE OYSTER OSTREA EDULIS,
Institute of Marine Biochemistry, Aberdeen (Scotland).
For primary bibliographic entry see Field 5A.
W79-02784

THE EFFECTS OF THREE PHTHALATE ESTERS ON THE LARVAL DEVELOPMENT OF THE GRASS SHRIMP PALAEMONETES PUGIO (HOLTHUIS),
Texas A and M Univ., College Station. Dept. of Biology.
R. B. Lauhglin, Jr., J. M. Neff, H. R. Hrung, T. C. Goodwin, and C. S. Giam.
Water, Air, and Soil Pollution, Vol. 9, p 323-336, 1978. 4 fig, 3 tab, 32 ref.

Descriptors: *Shrimp, *Toxicity, *Growth stages, *Growth rates, *Larval growth stage, *Animal metabolism, *Bioassay, *Mortality, *Animal physiology, *Absorption, Crustaceans, Organic compounds, Water pollution effects, *Esters, Phthalate esters, *Zoeae, Palaemonetes, *Tissue.

The effects of three phthalic acid esters, dimethyl phthalate (DMP) di-n-butyl phthalate (DEP), and di-2-ethylhexyl (DEHP) on survival and development rate of larvae of the grass shrimp were investigated. Only 100 ppm DMP and 10 to 50 ppm DBP were acutely toxic to the larvae. DMP at a concentration of 100 ppm significantly increased the duration of larval development to the first postlarval stage. DEHP concentrations up to 1 ppm (the solubility limit of this ester) were without effect on either survival or development rate of the larvae. Phthalate esters were not detectable at or above the 2 ppm level in the tissues of larvae chronically exposed to phthalates for the duration of larval development, suggesting active metabolism of phthalates by this species. (EIS-Deal)
W79-02786

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS, DOCUMENT NO. 3.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5E.
W79-02792

STABILITY OF HUMAN ENTEROVIRUSES IN ESTUARINE AND MARINE WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-02803

DENITRIFICATION IN A MASSACHUSETTS SALT MARSH,
Boston Univ., MA. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-02812

SEICHE STRUCTURE AND VERTICAL MIXING BELOW THE EPILIMNION IN SMALL LAKES,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
P. Kilham, J. P. Adams, and B. D. LaZerte.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 400, Price codes: A09 in paper copy, A01 in microfiche. Institute of Water Research, Michigan State University, East Lansing, Project Completion Report, Jan, 1979. 198 p. 47 fig, 6 tab, 47 ref, append. OWRT A-094-MICH(1), 14-34-0001-7048.

Descriptors: *Seiche structure, *Planktonic diatoms, Internal seiche structure, Seasonal shifts, Currents, Lakes, *Michigan, *Vertical stratification, *Spatial stratification, Epilimion, Hypolimion, Eutrophication, Turbulent mixing, Cyanophyta, *Frains Lake(Mich), Asterionella formosa, Synedra filiformis, Stephanodiscus hantzschii, Water pollution effects, Water pollution control.

The internal seiche structure of Frains Lake, Michigan has several vertical modes during summer stratification. The lowest frequencies have the greatest amplitudes, down to 0.05 cycles per half-hour, with the higher frequencies becoming progressively less dominant. The fundamental vertical internal mode is imperceptible. The phase shifts with depth of the observed vertical harmonics correspond well with those predicted by a discrete approximation to the continuous density internal wave equations. In addition, seasonal shifts in frequency and phase displacement that follow the seasonal changes in the temperature profile were predicted and observed. Currents in the hypolimnion are primarily driven by internal seiches. The major conclusion is that hypolimnion region of small lakes can be turbulently mixed by currents primarily driven by internal seiches. This important observation should be of use in the prediction and management of algal blooms. Vertical nutrient flux from the hypolimnion can be a major source of nutrients that sustain meta- and epilimnetic blooms of noxious blue-green algae. In addition, turbulent mixing of the hypolimnion increases steepness of the diffusion gradients between the sediments and the bottom water and the hypolimnion and the epilimnion. As a result vertical nutrient flux will be greater in small lakes with turbulent hypolimnia.
W79-02813

FIELD ESTIMATES OF AQUATIC PLANT RESPIRATION AND ITS APPLICATION OF STREAM DISSOLVED OXYGEN BUDGETS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
A. J. McDonnell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 333, Price codes: A03 in paper copy, A01 in microfiche. Pennsylvaia State University Research Project Technical Completion Report, December 1978. 41 p, 9 fig, 8 tab, 41 ref. OWRT B-026-PA(1), 14-31-0001-3123.

Descriptors: *Eutrophication, Aquatic plants, *Natural streams, Plant populations, Streams, *Dissolved oxygen, *Respiration, Reaeration, Low flow, Energy dissipation, *Aquatic plant growth, *Stream oxygen budget, Oxygen consumption, Dissolved oxygen concentration, Plant communities.

Daily measurements of dissolved oxygen variations were made throughout a calendar year on three separate segments of a stream subjected to aquatic plant growth. Mass balance budgets, quantifying respective sources and sinks of dissolved oxygen for the study segments, demonstrated the validity of incorporating an aquatic plant respiration pattern which varied in direct proportion to dissolved oxygen concentration. The effects of oxygen consumption by the plant population on field estimates of reaeration, daily gross primary productivity, community respiration and maximum net primary productivity in the budgeting process are evaluated. (Sink-Penn State)
W79-02816

PARASITES AND RELATED PATHOLOGY OF THE COTTONTAIL RABBIT (SYLVILAGUS FLORIDANUS) IN CENTRAL PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Veternary Science.
J. P. Wiggins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 422, Price codes: A06 in paper copy, A01 in microfiche. PhD Dissertation, November, 1977. 101 p, 2 fig, 12 tab, 118 ref. OWRT B-084-PA(4), 14-34-0001-6113.

Descriptors: *Seasonal, *Pennsylvania, *Animal pathology, *Animal parasites, Parasitism, *Cottontail rabbit, *Coccidiosis, *Helminth infection, Trapping season, Trap site, Liver, Lung, Spleen, Skeletal muscle, Body weight, Hematoloty, Red blood cell count.

Over three years, 131 cottontail rabbits were examined for parasites and associated pathology after necropsy. The numbers of oocysts and helminth ova were unaffected by sex, age, trap site, trapping season, or year. Resuls indicate that differences in coccidiosis and helminth infection determined by the number of parasite species infecting the host animal are affected by year with a possibility of seasonal influence on coccidiosis. Gastro-intestional pathology was affected by sex for stomach lining; intestinal sections were affected by age, year, and trap site. Liver, lung, spleen, skeletal muscle, and Sarcocystis leporum infection scores were also influenced by one or more of the factors considered, while pathology of adrenals, brain, heart, and kidney were unaffected. Correlations of parasite data and body weights, measurements, hematology, and blood chemistry indicated that coccidiosis affects the body size of the host; helminth infections affect the blood parameters by decreasing red blood cell counts and compensation by the host. This research verifies that parasitism by coccidia and helminths is normal in cottontails and at the present time levels do not appear to severely interfere with host health. (Sink-Penn State)
W79-02833

A PRELIMINARY INVESTIGATION OF THE PHOSPHORUS LOADING CHARACTERISTICS OF LAKE CARNEGIE, PRINCETON, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W79-02835

TOXICITY OF BOG WATER TO EMBRYONIC AND LARVAL ANURAN AMPHIBIANS,
The Pennsylvania State Univ., University Park.
P. A. Saber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 434, Price codes: A03 in paper copy, A01 in microfiche. MS Thesis, August 1977. 28 p, 2 fig, 6 tab, 39 ref OWRT A-042-PA(4), 14-34-0001-6039.

Descriptors: *Amphibians, *Bogs, *Acidic water, Hydrogen ion concentration, *Toxicity, Larvae, Water pollution effects, *Anuran larvae, Embryo, Bullfrog, Clawed frog, Low pH.

A survey of the amphibians of a north temperate zone bog revealed that a number of species common in suitable locations nearby were absent from the bog. Several species of anuran larvae and embryos suffered high mortality when placed in the naturally acidic stream draining the bog. Mortality of bullfrog larvae (Rana catesbeiana) placed at a nunmber of sites along the natural pH gradient (pH 3.9-6.6) formed by this stream was significantly greater than in those placed in a clearwater control stream (pH 6.6-6.9). This lethality of stream water even at moderate pH's near 6.0 indicates that a toxic factor other than acidity may be involved. In the laboratory, mortality of clawed frog (Xenopus laevis) embryos was significantly greater in unaltered bog water (pH 4.0-4.3) than in bog water neutralized with sodium hydroxide or in charcoal filtered tap water. The latter two conditions did not show significant mortality differences. This implies that low pH is the principal source of toxicity for Xenopus. (Sink-Penn State)
W79-02837

EFFECTS OF TEMPERATURE ON GROWTH CONSTANTS OF SELENASTRUM CAPRICORTNUTUM,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
J. H. Reynolds, E. J. Middlebrooks, D. B Porcella, and W. J. Grenney.
Journal of Water Pollution Control Federation, Vol. 47, No. 10 p 2420-2436, October 1975. 7 fig, 10 tab, 27 ref. OWRT B-070-UTAH(7), 14-01-0001-3845.

Descriptors: Algae, *Growth, Kinetics, *Selenastrum capricornutum, *Temperature.

The alga Selenastrum capricornutum (Printz) has been specified for use in bioassays by the Environmental Protection Agency. Continuous-flow (chemostat) experiments conducted at 20 degrees, 24 degrees, 27 degrees, 28 degrees, and 33 degrees C indicated that S. capricornutum exhibits luxury uptake of ammonium-nitrogen. The luxury uptake of the organism may be described by either a first-order or a hyperbolic function. The nutrient utilization constants for both luxury uptake functions have a maximum value of 3.16 and 2.46 days, respectively, at 24 degrees C. The constants decrease as the temperature is increased or decreased from 24 degrees C. The maximum specific growth rates of the organism at 20 degrees, 24 degrees, 27 degrees, 28 degrees, and 33 degrees C are, respectively, 1.365, 1.992, 1.412, 1.390, and 1.274 days, the maximum occurring between 24 degrees and 27 degrees C. The value of the ammonium-nitrogen half-saturation constant was constant between 20 degrees and 33 degrees C, with an average value of 5.356 microg/l NH4-N
W79-02876

USE OF HISTOLOGIC AND HISTOCHEMICAL ASSESSMENTS IN THE PROGNOSIS OF THE EFFECTS OF AQUATIC POLLUTANTS,
Louisville Univ., KY. School of Medicine.
D E Hinton, M W Kendall, and B B Silver.
In: Biological Methods for the Assessment of Water Quality. American Society for Testing and Materials, Special Technical Publication No. 528, p 194-208, 1973. 23 fig, 30 ref. OWRT A-038-KY(4). 14-31-0001-3517

Descriptors: Water pollution effects, Fish physiology, *Channel catfish, Methylmercuric chloride, Pollutant identification, *Histology, *Histochemistry, Histopathology, Cytochemistry

Application of histologic and histochemical techniques to the determination of effects of aquatic pollutants upon fish tissues is discussed. Definition of terms and techniques associated with appropriate preparation of tissue specimens are given. Illustrations include examples from control and altered tissues. A summary of work with methyl mercuric

chloride in channel catfish illustrates the use of both techniques in assessing the prognosis of the effects of aquatic pollutants upon fish tissues. (Huffsoy-Kentucky)
W79-02877

THE CALIBRATION OF A PHYTOPLANKTON GROWTH MODEL USING BATCH CULTURE DATA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
T. Lederman, C. Hornberger, and G.G. Kelly.
Water, Air and Soil Pollution, Vol 5 p 431-442, 1976. 7 tab, 31 ref.

Descriptors: *Model studies, *Eutrophication, Lakes, Digital computers, Calibration, *Phytoplankton, *Predictive model, Testing, Evaluation, Ecological changes.

The feasibility of applying nonlinear parameter estimation techniques to data from batch culture of phytoplankton is studied using simulated data. A Monod-type model for nutrient uptake and growth in phytoplankton is used for the simulation. A parameter estimation procedure is applied to these data before and after they are noise-corrupted, to obtain back-calculated values of the parameter in the model. The results indicate that nonlinear parameter estimation is well suited for analytical interpretation of batch-culture data.
W79-02878

PRODUCTIVITY OF OSPREYS IN CONNECTICUT-LONG ISLAND INCREASES AS DDE RESIDUE DECLINES,
Cornell Univ. Ithaca, NY. Section of Ecology and Systematics.
P. R. Spitzer, R. W. Risenbrough, W. Walker, II, R. Hernandez, and A. Poole.
Science, Vol. 202, p 333-335, 1978. 1 fig, 1 tab, 24 ref.

Descriptors: *DDE, *Pesticide residues, *Pesticide toxicity, *Dieldrin, *Fecundity, Animal physiology, Animal pathology, Animal metabolism, *Polychlorinated biphenyls, Mercury, Non-Game birds, Birds, Chlorinated hydrocarbon pesticides, Reproduction, Pesticide kinetics, Path of pollutants, Toxicity, Productivity, *Osprey, Tissue analysis, *Bioaccumulation.

Nesting success of ospreys breeding in the Connecticut-Long Island area has increased since 1973 and is now approaching the levels recorded prior to the 1950's. Simultaneously, DDE and dieldrin residues have declined in unhatched eggs. Levels of polychlorinated biphenyls have shown no changes over the period 1969 to 1976. The increase in productivity is attributed primarily to lower levels of DDE contamination. Detrimental effects in the past on ospreys in the Connecticut River estuary are attributable to local contamination with dieldrin. (EIS-Deal)
W79-02886

TRACE METALS IN SOME FISH SPECIES OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W79-02887

CADMIUM AND ZINC CONTENT OF FISH FROM AN INDUSTRIALLY CONTAMINATED LAKE,
Purdue Univ., Lafayette. IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5A.
W79-02888

TOXICITY-, ACCUMULATION-, AND ELIMINATION STUDIES OF ALPHA-HEXACHLOROCYCLOHEXANE (ALPHA-HCH) WITH SALTWATER ORGANISMS OF DIFFERENT TROPHIC LEVELS,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Toxicology.
J. H. Canton, R. C. C. Wegman, J. A. Vulton, C. H. Verhoef, and G. J. Van Esch.
Water Research, Vol. 12, p 687-690, 1978. 4 fig, 4 tab, 8 ref.

Descriptors: *Toxicity, *Brine shrimp, Organic compounds, Path of pollutants, Trophic level, Marine algae, Crustaceans, Fish physiology, Animal metabolism, Chemical analysis, Chemical properties, Growth rates, Salinity, Bioassay, Montalities, Chlorinated hydrocarbons, Hexachlorocyclohexane, *Bioaccumulation, *Tissue analysis, *Lebistes, Guppies, Artemia, Brine shrimp, Dunaliella.

A short-term study with alpha-HCH was carried out with saltwater organisms of different trophic levels: the alga Dunaliella, the crustacean Artemia, and the fish Lebistes, acclimated to water of gradually increased salinity. Within the solubility range of alpha-HCH in saltwater, there was no influence on the growth of Dunaliella. The LC50 (4 days) for Artemia was 0.5 mg l-1. In the longterm study the LC50 (35 days) for Lebistes proved to be 0.5 mg l-1. In the accumulation studies the concentration factor was about 60-90 with Artemia and about 500 with Lebistes. Equilibrium levels were reached within 24 and 48 h respectively. In the elimination studies the alpha-HCH concentration was halved within 48-72 h in Artemia and within 10 h in Lebistes. (EIS-Deal)
W79-02889

LES OLIGOCHETES D'UN COURS D'EAU MONTAGNARD POLLUE: LE BIEF ROUGE (THE OLIGOCHAETES OF A POLLUTED MOUNTAIN STREAM: THE BIEF ROUGE),
Centre Technique du Genie Rural des Eaux et des Forets, Paris (France). Centre d'Hydroecologie.
M. Lafont.
Annales de Limnologie, vol. 13, no. 2, p 157-167, 1977. 3fig., 2tab., 22ref.

Descriptors: *Oligochaetes, *Waste water(Pollution), *Effluents, *Worms, Annelids, Invertebrates, Distribution patterns, Aquatic life, Benthic fauna, Bioindicators, Streams, Water quality, Environmental effects, Speciation, Succession, Population, Indicators, *Bief Rouge(France).

The effects of organic wastes on the oligochaetes of the Bief Rouge were shown by the development of 3 species that were prolific to the detriment of other oligochaetes: x I. tubifex, N. elinguis, S. heringianus (and to a certain degree, N. communis). In contrast, neither L. hoffmeisteri or L. udekemianus attained high densities. The results indicated the usefulness of oligochaetes as bioindicators of water quality. It appeared that associations of pollution-resistant species varied depending upon the type of flowing water and the level of contamination. (EIS-Klein)
W79-02893

UTILISATION DU PROTOZOAIRE CILIE COLPIDIUM CAMPYLUM POUR LA MESURE DE LA TOXICITE ET DE L'ACCUMULATION DES MICROPOLLUTANT: ANALYSE CRITIQUE ET APPLICATIONS (USE OF THE CILIATED PROTOZOA COLPIDIUM CAMPYLUM FOR THE MEASUREMENT OF TOXICITY AND ACCUMULATION OF MICROPOLLUTANTS: ANALYSIS AND APPLICATION),
Institut Pasteur, Lille (France). Ecotoxicologie Microbienne Inst.
D. Dive, and H. Leclerc.
Environmental Pollution, Vol. 14, p. 169-186, 1977. 9 fig, 7 tab, 13 ref. (In French with English abstract).

Descriptors: *Toxicity, *Methodology, *Protozoa, Toxicants, Research and Development, Population, Growth rates, Bioassay, Microorganisms, Invertebrates, Water quality, Mortality, Lethal limit, Analytical techniques, Waste water(Pollution), *Polychlorinated biphenyl, Arsenic compounds, Mercury, Zinc, Cadmium, Copper, Lead, Phenols, Alcohols, *Bioaccumulation, Colpidium campylum, Cyanides.

A previously described method using C. campylum for toxicity bioassays was analyzed after two year's use. Dispersion of mean start populations and detection threshold of Coulter Counter R used for counts affected accuracy and reproducibility of results. The method was used to measure the minimal toxic dose of 17 water-soluble toxic substances. The method of use for direct toxicant determination of tap and drinking water, sewage, and industrial waste waters was discussed. Among substances tested were polychlorinated biphenyls, Arsenic, Mercury, Zinc, Cadmium, Copper, Lead, Cyanide, Phenol, and Ethanol. (EIS-Klein)
W79-02894

ACTIONS ECOTOXICOLOGIQUES DE CERTAINS METAUX (CU-ZN-PB-CD) CHEZ LES POISSONS DULCAQUICOLES DE LA RIVIERE LOT (THE ECOTOXICOLOGICAL ACTION OF SOME METALS (CU-ZN-PB-CD) ON FRESHWATER FISH IN THE LOT RIVER,
Ecole National Superieure Agronomique de Toulouse (France). Lab. de Ichtyologie Appliquee.
R. Labat, C. Roqueplo, J. M. Ricard, P. Lim, and M. Burgat.
Annales de Limnologie, vol. 13, no. 2, p 191-207, 1977. 6 fig, 9 tab, 18 ref.

Descriptors: *Freshwater fish, *Water quality, *Metals, *Toxicity, *Copper, *Zinc, *Lead, *Cadmium, Absorption, Sampling, Fish physiology, Path of pollutants, Biological membranes, Analytical techniques, *Lot River(France), Tissue analysis, Bioaccumulation.

Contamination of 15 species of fish by the heavy metals Cu, Zn, Pb and Cd was most evident at stations downstream from pollution sources on the Lot River. The fish tissues exhibited passive accumulation of the metals related to the metal concentrations in the water. There was thought to be 3 critical thresholds of metals in the water, each one affecting different physiological processes. Metal contamination affected passive absorption through the gills and food absorption against a gradient through the gut. (EIS-Klein)
W79-02895

UNTERSUCHUNGEN ZUR INTENSIVHALTUNG VON FISCHEN IM WARM-WASSERKREISLAUF (STUDIES REGARDING INTENSIFIED FISH CULTURE IN A CLOSED WARM WATER SYSTEM),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
L. Nagel, C. Meske, and K. Mudrack.
Archiv fur Fischwissenschaft, Vol. 27 (1), 1976, p 9-23. 7 fig, 42 ref.

Descriptors: *Aquiculture, *Carp, Fish establishment, Fish farming, Fish physiology, Growth rates, *Nitrates, Nitrites, Waste water treatment, Waste water disposal, Laboratory tests, Microbial degradation, Microbiology, Oxidation, Sludge, Sludge disposal, Nitrogen compounds, *Controlled denitrification, *Bacterial nitrification, Microbial denitrification.

The possibility to treat waste water in a closed warm water system (60 m3) for intensified fish culture by activated sludge without reaching toxic substrate levels for carp during a period of more than three years (July 1972-December 1975) could be shown. Despite the high concentrations of nitrate (to 1800 mg NO3/1) a continuous weight increase of fish could be gained. The inclusion of a special denitrification tank resulted a controlled reduction of the nitrate to free nitrogen, and a decrease of the nitrate concentration to 200 mg NO3/1. Due to the removal of excess sludge and the loss of water by evaporation and overspill a daily addition of about 2% fresh water was necessary.
W79-02896

BENZO(A)PYRENE MONOOXYGENASE INDUCTION IN MARINE FISH -MOLECULAR RESPONSE TO OIL POLLUTION,

Institut Rudjer-Boskovic, Rovinj (Yugoslavia). Lab. for Marine Molecular Biology.
B. Kurelec, S. Britaric, M. Rijavec, and W. E. G. Miller.
Marine Biology, Vol. 44, 1977, p 211-216. 1 tab, 3 fig, 24 ref.

Descriptors: *Marine fish, Monitoring, Oil, Oil pollution, *Water pollution effects, Path of pollutants, Animal metabolism, Animal biochemistry, Fish physiology, *Oil spills, Fish physiology, Benthic fauna, Laboratory tests, On-site-investigations, *Benzo(a)pyrene monoxygenase, Blenniideae, Blennius pavo, *Diesel fuel, *No. 2 fuel oil, Sardines, Northern Adriatic, Fish livers, *Molecular response.

Induction of benzo(a)pyrene monooxygenase (BPMO) activity occurred in Blennius pavo, a species with a restricted territorial range, in response of exposure to a Diesel 2 oil. A response delay of 14 days was found at a concentration of 170 ppb and of 3 days when the water was saturated with Diesel 2 oil. When induced fish were transferred to clean water, elevated BPMO x activity was maintained at a high level for at least a month. A benthic protochordate, Microcosmos sulcatus, showed no increase in BPMO activity when exposed to these concentrations even after 30 days of exposure. Field observations revealed a great variation in the BPMO activity from B. pavo caught at different sites. Fish from contaminated sites had significantly elevated levels of BPMO activity. Sardine schools caught at different sites had different, low levels of BPMO activities. However, specimens from the same school had closely similar levels of enzyme activity. Measurement of BPMO activity in the livers of non-migrant fish could serve as a useful biochemical parameter for monitoring and evaluation of acute or long-term oil pollution at a given site. (EIS-Katz)
W79-02898

POOLS OF NITROGEN IN A GEORGIA SALT MARSH,
Georgia Univ., Athens.
A. G. Chalmers.
PhD Dissertation, 1977. 162 p.

Descriptors: *Salt marshes, *Georgia, *Nitrogen, Wetlands, Marshes, Tidal marshes, Nitrites, Nitrates, Soil gases, Ammonia, Salinity, Marsh plants, Nitrogen cycles, Turnovers, Sludge.

Seasonal variations were studied of the standing stocks of exchangeable ammonium, nitrite, nitrate, total nitrogen, and salinity in soils and total nitrogen in plants in both the high and low marsh with respect to soil nitrogen. However, annual accumulation in aboveground biomass of Spartina alteniflora was 9.84 g N/sq m in the low marsh and 4.69 g N/sq in the high marsh, suggesting the existence of additional inputs of N or more rapid turnover of soil N in the low marsh. Based on estimates of annual flux of N to S. alterniflora and standing stock of exchangeable ammonium, turnover times of inorganic N were calculated, ranging from 6-20 days for the high marsh and 3-6 days for the low marsh. Addition of sludge to short S. alterniflora marsh resulted in higher total N concentrations in the top 5 cm of the soil, in higher NH4(+) concentrations, and increased S. alterniflora biomass. Salinities in the sludge-amended areas were higher than in unfertilized areas probably due to increased transpirations. (Steiner-Mass)
W79-02899

ARSENIC EXCRETION BY MONKEYS DOSED WITH ARSENIC-CONTAINING FISH OR WITH INORGANIC ARSENIC,
Health and Welfare Canada, Ottawa (Ontario). Toxicology Research Div.
S. M. Charbonneau, K. Spencer, F. Bryce, and E. Sandi.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 4, p 470-477, 1978. 2 tab, 21 ref.

Descriptors: *Animal metabolism, *Arsenic compounds, Path of pollutants, Animal physiology, Mammals, Chemical analysis, Chemical properties, Digestion, Metabolism, Inorganic compounds, Public health, Commercial fish, *Arsenic.

Four female Cynomolagus monkeys were given single oral doses of fish arsenic. 67% of the arsenic was excreted in the urine and 10% with the feces, essentially within 5 days post exposure. The same monkeys were later dosed with inorganic arsenic, and 76% of it was excreted with the urine and practically none with the feces. (EIS-Deal)
W79-02901

FATE AND EFFECTS OF CRUDE OIL SPILLED ON PERMAFROST TERRAIN. FIRST YEAR PROGRESS REPORT,
Army terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5B.
W79-02902

THE POTENTIAL AND REALIZED INFLUENCES OF TEMPERATURE ON THE DISTRIBUTION OF FISHES IN THE NEW RIVER, GLEN LYN, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. R. Stauffer, Jr., K. L. Dickson, J. Cairns, Jr., and D. S. Cherry.
The Journal of Wildlife Management, Supplement No. 50, 40 p, November 1976. 24 fig, 5 tab, 69 ref.

Descriptors: *Water temperature, *Fish behavior, *Fish physiology, Animal behavior, Habitats, Channel catfish, Bass, Suckers, Shiners, Darters, Statistical methods, Mathematical studies, Virginia, *Multivariate analysis, *New River(Va), Glen Lyn(Va).

Temperature preference and avoidance data for several fish species on which there was previously little or no information were provided. The importance of studying the effects of environmental parameters of each species on a site specific basis was demonstrated. The application of multivariate screening techniques to in situ fish allowed the influence of temperature with respect to other variables to be evaluated. (EIS-Deal)
W79-02903

APPLICATION OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY TO THE STUDY OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS RELEASED BY ALGAE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W79-02906

CHROMATOGRAPHIC STUDIES OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS RESULTING FROM ALGAL CULTURES,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W79-02907

DETRITUS AS FOOD FOR ESTUARINE COPEPODS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2L.
W79-02916

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE NEW YORK BIGHT, FIRST AND SECOND MONITORING CRUISES, NOVEMBER 1975 AND MARCH 1976,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
J. Caracciolo, J. Pearce, M. Halsey, and L. Rogers.
NOAA Data Report ERL MESA-40, September 1978. 51 p, 1 fig, 9 ref, append.

Descriptors: *Benthos, *Water pollution effects, *Baseline studies, Ecosystems, Environmental effects, Monitoring, Distribution, *Outer Continental Shelf, *New York Bight.

Analyses of benthic communities have been used since 1968 to indicate impacts from contaminants on the ecosystem of the New York Bight apex. This data report is a product of the fourth phase, monitoring of selected stations in the apex, and was prepared to provide machine listed data and certain statistical calculations, diversity and equitability concerned with the distribution and abundance of benthic organisms collected at 18 monitoring stations located in the standard New York Bight MESA sampling grid. Data from these stations will yield information on changes in the Bight over time by providing more replicate samples which may be compared with earlier samples collected at the same stations. Moreover, these stations also form the basis for sampling strata 4 of the new NMFS Ocean Pulse environmental assessment program. (NOAA)
W79-02922

SUBLETHAL EFFECTS OF TREATED LIQUID EFFLUENT FROM A PETROLEUM REFINERY ON FRESHWATER ORGANISMS,
Sprague (J. B.) Associates Ltd., Guelph (Ontario).
J. B. Sprague, D. W. Rowe, G. F. Westlake, T. A. Heming, and I. T. Brown.
Petroleum Assoc. for Conservation of the Canadian Environment; Petroleum and Industrial Organic Chemical Div., Water Pollution Control Directorate, EPS, Fisheries and Environment Canada, Ottawa, Canada, October, 1978, 297 p., 53 ref., Addendum A, Addendum B.

Descriptors: *Liquid wastes, Oil industry, Aquatic animals, *Waste disposal, Effluents, Daphnia, Rainbow trout, Sampling, Testing, Treatment, Growth rates, Respiration, Reproduction, *Lethal limit, Application methods, Assay, *Oil pollution, Water pollution effects, *Oil wastes, *Canada, *Flagfish.

Sublethal tests used twice-weekly samples of treated liquid effluent from a petroleum refinery. The tests were conducted using rainbow trout, small tropical flagfish and Daphnia pulex as the organisms. Over two years, 71 of 94 effluent samples met federal guidelines for non-lethality to trout. Six specified physico-chemical characteristics had average values within or near federal guidelines Sublethal experiments were based on non-lethal samples of effluent. Growth of rainbow trout was severely affected at 30% concentration of effluent, and threshold for effect was judged to be close to 10%. For growth, survival, and reproduction of the small tropical flagfish, the threshold was similar, at about 9%. Trout did not show any obvious avoidance reactions up to 30% effluent. However, their general locomotor activity increased at 10% and decreased sharply at 30%. Respiratory rate of trout was not significantly changed at 50% effluent, but increased at 100%. Coughing increased linearly with concentration with a threshold of significant change between 25 and 50% effluent. Daphnia pulex were killed in two days by 76% effluent and were 2.5 times as sensitive as trout. The 'safe' concentration, which would not significantly affect reproduction of Daphnia, was estimated to be 0.52%. (WATDOC)
W79-02929

PLANT STANDING CROP AND PRODUCTIVITY RELATIONS IN A SCIRPUS-EQUISTUM WETLAND,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-02936

THE RELATIONSHIP BETWEEN NET PRIMARY PRODUCTION AND ACCUMULATION FOR A PEATLAND IN SOUTHEASTERN MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Botany
R. J. Reader, and J. M. Stewart.

Ecology, Vol. 53, No. 6, p. 1024-1037, Autumn, 1972. 5 fig, 5 tab, 29 ref.

Descriptors: *Peat, *Decomposing organic matter, *Primary productivity, Litter, Wetlands, Accumulation, *Canada, *Manitoba.

Two functional attributes of an ecosystem, net primary production and subsequent dry matter accumulation, were examined in four peatland types (lagg, bog, muskeg and bog forest) located in southeastern Manitoba. A preliminary peat accumulation budget was constructed by relating the amount of litter present after a single year of decomposition to the initial litter income and annual net primary production. Annual litter 'income' in the four vegetation zones ranged from 489 gm/sq m to 1,750 gm/sq m, which represented 69% to 90% of the calculated net primary production. Decomposition losses in the following year amounted to approximately one quarter of the original income. An average annual accumulation rate of 26 gm/sq m/year to 51 gm/sq m/year was calculated from radiocarbon-dated peat cores, thus suggesting that less than 10% of the annual net primary production will remain as peat. (Stihler-Mass)
W79-02938

NUTRIENT-PHYTOPLANKTON RELATIONSHIPS IN THE HOLLAND MARSH, ONTARIO,
Guelph Univ. (Ontario), Dept. of Zoology.
K. H. Nicholls.
Ecological Monographs, Vol. 46, No. 2, p. 179-199, Spring, 1976. 13 fig, 3 tab, 100 ref.

Descriptors: *Marshes, *Phytoplankton, *Nutrients, Biomass, Chlorophyll, Nitrogen, Phosphorus, Diatoms, Fresh water marshes, Wetlands, *Canada, Holland Marsh(Ont).

Over a year, Chlorophyceae comprised one-half, Bacillriophyceae about one-third, and Cyanophyceae less than one-tenth of the standing crop of phytoplankton in the Holland Marsh, Ontario. Diatoms were dominant in the spring and in the fall when the total phytoplankton biomass was as high as 32,000,000 cubic micrometers per ml. Chlorococcalean forms dominated in summer. Winter phytoplankton showed more diversity with a considerably lower biomass of 160,000 to 2,900,000 cubic micrometer per ml. Maximumchlorophyll a concentrations of 358 micrograms per liter compare with data from highly eutrophic waters. Chlorophyll a content of the phytoplankton ranged from 0.14$ to 1.65% of fresh weight with the value in November exceeding the May value by almost three times. Chlorophyll a contents were lowest in summer, intermediate in spring, and highest in winter when supplies of inorganic nitrogen were ample and daily incident radiation was lowest. Inorganic nitrogen most likely limited summer phytoplankton growth. The initial effects of improved nutrient retention within intensively cultivated and urban areas on the Holland River watershed is suggested as a cause of the shift in the limiting nutrient for the spring bloom from silicon dioxide to phosphorus. (Howard-Mass)
W79-02944

OSMOTIC BALANCE AND RESPIRATION IN THE HERMIT CRAB, PAGURUS BERNHARDUS, EXPOSED TO FLUCTUATING SALINITIES,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Zoology Unit.
S. E. Shumway.
Journal of the Marine Biological Association of the United Kingdom, Vol. 58(4), 1978. p 869-876, 1 tab, 5 fig, 11 ref.

Descriptors: *Salinity, *Animal behaviour, Animal metabolism, *Animal physiology, Environmental gradient, *Crustacea, Crabs, Hermit crabs, Pagurus bernhardus, Oxygen, *Oxygen requirements, Laboratory tests, Laboratory equipment, Methodology, *Fluctuating, Salinities, Statistical methods.

Specimens of Pagurus bernhardus (with and without shells) were exposed to both gradual (sinusoidal) and abrupt (square-wave) salinity fluctuations and changes in haemolyph osmolality, tissue water content and oxygen consumption monitored. Oxygen consumption was also monitored under steady-state conditions; under these conditions there was no significant difference between the rate of oxygen consumption by animals with shells and animals without shells. During exposure to fluctuating salinities the crabs with shells were seen to increase locomotory activity when the external medium declined to approximately 75% sea water. Haemolymph osmolality values followed the same pattern of change as the external medium; the haemolymph of crabs without shells became significantly more dilute during exposure to low salinity than did that of crabs with shells. Crabs with shells showed a marked temporary increase in oxygen consumption when the external medium declined to approximately 75% sea water; crabs without shells showed no such response. The importance of the shell as a means of protection against dilute media is discussed. (EIS-Katz)
W79-02957

ACUMULACION Y EFFECTOS HISTOPATOLOGICOS DEL MERCURIO INORGANICO Y ORGANICO EN LA LISA (MUGIL AURATUS RISSO) (ACCUMULATION AND HISTOPATHOLOGICAL EFFECTS OF INORGANIC AND ORGANIC MERCURY ON THE MULLET),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Lab. de Investigaciones Pesqueras.
R. Establier, M. Gutierrez, and A. Arias.
Investigacion Pesquera Vol. 42(1), 1978, p 65-80. 2 tab, 1 fig, 10 ref.

Descriptors: Metals, *Mercury, *Methylmercury, *Marine fish, Commercial fish, *Public health, Water pollution effects, Path of pollutants, Accumulation, *Bioaccumulation, Fish diseases, Fish physiology, Anima pathology, Mullets, Bioassay, Histology, Histopathology, DSea water, Laboratory tests.

Accumulation and histopathological effects of organic and inorganic mercury to the lisa, Mugil auratus. Mercury inorganic (HgCl2) and organic mercury (CH3HgCl) uptake by Lisa, Mugil auratus, exposed to 0.1 ppm of Hg(HgCl2) in sea water for 10, 24, 35, 46 and 57 days and 0.008 ppm of Hg (Ch3HgCl) in sea water for 15, 30 and 45 days is studied. Accumulation of mercury in flesh, blood, liver, kidney, spleen, intestine, piloric caeca and gills is determined. The histopathological aspects of this study were undertaken in the hope for a better knowledge of the effects of the mercury inorganic (HgCl2) on the liver and the intestine and the mercury organic (CH3HgCl) on the gills, stomach (muscular), liver, kidney, and intestine. (EIS-Katz)
W79-02958

ACUMULACION AND EFECTOS HISTOPATOLOGICOS DEL CADMIO Y EL MERCURIO EN EL SAPO (HALOBATRACHUS DIDACTYLUS) (ACCUMULATION AND HISTOPATHOLOGICAL EFFECT OF CADMIUM AND OF MERCURY ON THE SAPO),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Lab. de Investigaciones Pesqueras.
M. Gutierrez, R. Establier, and A. Arias.
Investigacion Pesquera, Vol. 42(1), 1978. p 141-154, 1 tab, 7 fig, 13 ref.

Descriptors: *Cadmium, *Mercury, Laboratory tests, *Bioassay, Metals, Water pollution effects, Path of pollutants, Tissue analysis, Fish physiology, Fish pathology, Fish diseases, *Commercial fish, *Public health, Tissue concentrations.

Cadmium and mercury uptake by Sapo, Halobatrachus didactylus, exposed to 50 ppm of Cadmium in sea water for 4 days and 0.1 ppm of Mercury in sea water for 49 days is studied. Accumulation of cadmium in flesh, blood, liver, kidney and intestine and mercury in flesh and liver is determined. The cytochematological and histopathological aspecgts of this study were undertaken in the hope for a better knowledge of the effects of cadmium and mercury on the blood, liver, kidney and intestine. (EIS-Katz)
W79-02959

THE DETECTION OF HEIGHTENED SEA-WATER COPPER CONCENTRATIONS BY THE MUSSEL MYTILUS EDULISL,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
For primary bibliographic entry see Field 5A.
W79-02960

FACTORS CONTROLLING THE AVAILABILITY OF SEDIMENT-BOUND LEAD TO THE ESTUARINE BIVALVE SCROBICULARIA PLANA,
Geological Survey, Menlo Park, CA.
S. N. Luoma, and G. W. Bryan.
Journal of the Marine Biological Assoc. of the United Kingdom, Vol. 58(4) 1978, p 793-802, 2 tab, 4 fig, 9 ref.

Descriptors: Metals, *Lead, Water pollution effects, Sediment, *Iron, *Lead/Iron Ratio, *Molluscs, Animal physiology, *Path of pollutants, Chemical analysis, Clams, Methodology, Estuaries, Biological availability, Southern England Estuaries, Western England, Northwest France, Tissue concentration, Sediments.

Concentrations of lead in the soft tissues of the deposit-feeding bivalve Scrobicularia plana have been compared with the phyiochemical characteristics of sediments of 20 estuaries in southern and western England and one in north-west France. The results indicate that the biological availability of lead in the sediment is controlled mainly by the concentration of iron, and that the concentration of lead in the bivalve may be predicted from the Pb/Fe ratio in 1 N hydrochloric acid extracts of surface sediments. (EIS-Katz)
W79-02961

INVESTIGATION OF A NUTRIENT-GROWTH MODEL USING A CONTINUOUS CULTURE OF NATURAL PHYTOPLANKTON,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
K. J. Jones, P. Tett, A. C. Wallis, and B. J. B Wood.
Journal of the Marine Biological Association of the United Kingdom, Vol. 58(4) 1978, p. 923-942, 5 tab., 9 fig., 23 ref.

Descriptors: *Phytoplankton, Laboratory tests, *Methodology, *Mathematical models, Biological community, *Nutrients, Phosphorous compound, Algae, Primary production, Nitrogen compounds, Growth chambers, *Growth rates, Chlorophyll, Laboratory equipment.

Phytoplankton from Loch Craran, Argyll was maintained in continous culture for 41 days. During most of this time the mixture ofj species retained the diversity and dominance pattern typical of summer phytoplankton in the loch, notwithstanding the manipulation of algal nutrient status to brong about phosphorus control of growth. Results suggest that most detritus was washed out early in the experiment. 'Quasi-steady states' with respect to concentration of chlorophyll, particulate carbon (PC), particulate phosphous (PP) and particulate nitrogen (PN), were observed at two levels of input of dissolved inorganic phosphorus. At other times the algal phosphorus quota (estimated from the ratio of PP to PC) varied from about 0.002 to 0.015 atoms P per atom C. Specific growth rate was estimated from the rate of increase of PC. During part of the experiment, growth rate was linearly related to reciprocal phosphorus quota, thus confirming the applicability of the model. (EIS-Katz)
W79-02962

SEASONAL PHYTOPLANKTON PRODUCTION IN THE WESTERN ENGLISH CHANNEL 1964-1974,

Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. T. Boalch, D. S. Harbour, and E. I. Butler.
Journal of the Marine Biological Association of the United Kingdom, Vol. 58(4), 1978, p 943-954, 5 fig., 23 ref.

Descriptors: *Phytoplankton, Marine algae, *Primary productivity, Atlantic Ocean, Carbon radioisotopes, *Methodology, Seasonal, On-site investigation, Carbon cycle diatoms, Dinoflagellates, *English Channel, 14C, Mean seasonal production, *Phytoplankton production, Laboratory equipment, Carbon fixation rates.

Over a period of 10 years, 1964-74, primary production has been measured at three stations across the western English channel using the 14C method. Results for carbon fixation, cell counts and mean seasonal production are illustrated. Statistical analyses show that, at two of the three stations, carbon fixation in 1966 was significantly greater than expected and that annual production differs significantly at each of the stations. The variations observed are discussed in relation to other changes recorded in the area during the same period. A deck incubator used for simulated in situ 14C experiments is illustrated. (EIS-Katz)
W79-02963

EFFECTS OF TEMPERATURE ON HATCHING SUCCESS AND SURVIVAL OF LARVAE IN THE WHITE BASS,
Environmental Research Lab., Duluth, MN.
J. H. McCormick.
The Progressive Fish Culturist, Vol. 40(4), Oct. 1978, p. 133-137, 2 tab., 26 ref.

Descriptors: *Water temperature, Freshwater fish, Bioassay, Laboratory tests, Fish eggs, Fish farming, Aquiculture, *White bass, *Juvenile fish, *Fish reproduction, *Mortality, Water pollution effects, Thermal pollution, Thermal stress, Hatching success, Larval survival, Morone chrysops.

Temperature effects on the hatching success of eggs of the white bass (Morone chrysops) were determined by exposing sample lots of recently fertilized eggs to 10 constant temperatures, 6 through 30C. Different lots of eggs were exposed to test temperatures before gastrulation, and after closure of the blastopore in the embryo. The percentages of normal larvae hatched were not significantly ($P > 0.05$) impaired in eggs exposed before gastrulation at temperatures from 18 through 26C, nor in those first exposed after closure of the blastopore at temperatures from 14 through 26C. Eggs incubated at 14C hatched 4.5 days after fertilization, and those incubated at 26C required only 1 day. The 24 h TL50 for white bass larvae exposed within 24 h of hatching and acclimated to 14, 18, 20, and 26C was between 30 and 32C, and was not altered by the acclimation temperatures tested. (EIS-Katz)
W79-02965

THERMAL RESISTANCE OF RAINBOW TROUT FROM A PERMANENTLY HEATED STREAM, AND OF TWO HATCHERY STRAINS,
Montana State Univ., Bozeman. Dept. of Biology.
C. M. Kaya.
The Progressive Fish Culturist, Vol. 40(4), Oct. 1978, p. 138-142, 2 tab., 2 fig., 17 ref.

Resistance times to high temperatures were determined for fingerling and juvenile rainbow trout (Salmo gairdneri) from the Firehole River, Yellowstone National Park, and from the Ennis and Winthrop hatchery strains, after acclimation to 5, 9, 13, 17, 21, and 24.5C. Firehole and hatchery trout acclimated to 21 and 24.5C had similar median resistance times and upper incipient lethal temperatures. After acclimation to the lower temperatures of 5, 9, 13, and 17C. Firehole trout had nonger median resistance times and slightly higher upper incipient lethal temperatures than did the hatchery trout. The ultimate upper incipient lethal temperature for the Firehole trout and for both hatchery strains was about 26.2C. Rainbow trout inhabiting and reproducing in the heated waters of the lower Firehole River do not appear to have developed the ability to acclimate to higher temperatures. (EIS-Katz)
W79-02966

ACCELERATED RATE OF ALBINISM IN CHANNEL CATFISH EXPOSED TO METALS,
Thomas Hunt Morgan School of Biological Sciences, Lexington, KY.
A. G. Westerman, and W. J. Birge.
The Progressive Fish Culturist, Vol. 40(4) Oct., 1978. p. 143-146, 2 tab., 19 ref.

Descriptors: Metals, *Arsenic compounds, *Cadmium, *Copper, *Mercury, *Selenium, *Zinc, Fish physiology, Fish disease, Channel catfish, Bioassays, Fish eggs, Aquiculture, Water supply, Fish hatchery, Water pollution effects, Fish pathology, *Albinism, Albinos, Mutagens.

Heavy metals (As, Cd, Cu, Hg, Se, Zn) were shown to increase the incidence of albinism during 5 years of experiments with channel catfish (Ictalurus punctatus). Metal-induced albinism resulted from exposure of both adult fish and eggs. In egg bioassays, exposed populations consistently exhibited higher percentages (up to 6.3%) of albinos than did controls, but frequencies did not vary significantly for the six metals or for exposure concentrations which ranged from 0.5 to 250 ug/1. Metal contamination in a hatchery water supply yielded frequencies of albinos corresponding directly with those observed for metal-exposed laboratory populations. Inasmuch as albinism has proved deleterious to fish survival and production, caution is recommended in using metallic compounds in hatchery management. Tests for albinism may prove useful in screening aquatic contaminants for mutagenic potential. (EIS-Katz)
W79-02967

PHYSIOLOGICAL EFFECTS OF ELECTRO-FISHING ON LARGEMOUTH BASS,
Northwestern State Univ. of Louisiana, Natchitoches. Dept. of Biological Sciences.
T. A. Burns, and K. Lantz.

Descriptors: *Methodology, *Largemouth bass, Fishing, Fishing gear, Fish physiology, Sampling, Fish biochemistry, Fish blood, Fish tissues, Stress, *Electric shocking gear, Electric current, *Electro-fishing, Micropterus salmoides.

Blood and tissue samples of adult largemouth bass (Micropterus salmoides) were taken from control fish and from fish that were electroshocked and allowed recovery times of 0,1,3,5.5, and 10 h. Shocking had no significant effect ($P > 0.005$) on hemoglobin, hematocrit, plasma protein, or percentage water content of tissue. No sexual differences in these factors were noted. Blood lactate increased significantly ($P > 0.01$) 1 h after electroshocking, returned to pre-shocked levels within a 3 h period, and then continued to decline. (EIS-Katz)
W79-02968

LETHALITY OF ELECTROSHOCK TO TWO FRESHWATER FISHES,
Wyoming Game and Fish Dept., Casper.
R. A. Whaley.
The Progressive Fish Culturist, Vol. 40(4), Oct., 1978. p. 161-163.

Descriptors: Freshwater fish, Bioassay, *Mortality, *Lethal limit, *Electric shocking, Electric current, *Electro fishing, *Electric fishing gear, Stress fishing, Fantail darter, Sunfish, Bluegill sunfish, Lepomis macrochirus, Etheostoma flavellare, Pulse frequency.

The lethality of electroshock to fish was examined by subjecting fantail darters (Etheostoma flabellare) and bluegills (Lepomis macrochiru) to levels and patterns of pulsating direct current electricity within the ranges commonly employed in the collection of fish in the field. Mortality of fish exposed to pulsating direct current increased with increased pulse frequency and exposure time. However, mortalities were negligible among fish exposed for 15 s or less, regardless of the electrical characteristics. (EIS-Katz)
W79-02969

TOXICITY OF SELECTED CHEMICALS TO THE FAIRY SHRIMP, STREPTOCEPHALUS SEALI, UNDER LABORATORY AND FIELD CONDITIONS,
Alabama Dept. of Conservation and Natural Resources, Montgomery. Game and Fish Div.
J. L. Moss.
The Progressive Fish Culturist, Vol. 40(4) Oct., 1978, p. 158-160, 2 tab., 12 ref.

Descriptors: *Toxicity, *Shrimp, Crustaceans, *Bioassay, Laboratory tests, Insecticides, Pesticides, *Chlorinated hydrocarbon pesticides, Mortality, Fairy shrimp, *Formalin, *Benzene hexachloride, *Diquat, *Paraquat, *Dylox, *Potassium permanganate, Streptocephalus seali.

Laboratory toxicity tests were conducted with six chemicals to determine their effect on fairy shrimp (Streptocephalus seali). Formalin (15 and 25 mg/1) and Diquat (0.25 to 2.0 mg/1) were not toxic to fairy shrimp. Paraquat (0.25 to 2.0 mg/1) and benzene hexachloride (0.10 and 0.25 mg/1) were moderately toxic. Cylox (0.10 and 0.25 mg/1) was highly toxic; mortality exceded 82% at 48 h. Potassium permanganate (0.5 to 4.0 mg/1) produced 100% mortality in less than 24 h. Pond treatments with potassium permanganate (1.0 and 2.0 mg/1) produced more rapid mortality than did Dylox (0.25 mg/1). Neither chemical completely eliminated all fairy shrimp from ponds, except in isolated cases. (EIS-Katz)
W79-02971

AN IMPROVED EXPERIMENTAL MEDIUM FOR FRESHWATER TOXICITY STUDIES USING DAPHNIA MAGNA,
Polytechnie of the South Bank London (England). Dept. of Applied Biology.
M. P. Tevlin.
Water Research, Vol. 12, p 1017-1024, 1978. 4 tab, 6 fig, 29 ref.

Descriptors: Metals, *Cadmium, *Iron, *Methodology, *Daphnia, Chlorella, *Bioassay, Laboratory tests, Toxicity, Water pollution effects, Laboratory equipment, Zooplankton, Phytoplankton, Freshwater, Hydrogen ion concentrations.

A medium suitable for Daphnia culture with the green alga, Chlorella sp. was chosen from the literature to investigate physiological responses by Daphnia to sublethal cadmium poisoning. Like most synthetic media this included the labile Fe-EDTA complex as a source of soluble iron which is shown to be essential for growth of both Daphnia and Chlorella. Synthesis of a ferri-gluconate complex as an alternative source of soluble iron is described; this complex being theoretically more iron-specific than Fe-EDTA, whilst providing equally well for Chlorella growth and Daphnia growth and fecundity. TES buffer (pKa 7.5) and HEPES buffer (pKa 7.55) were used at various concentrations, and 0.001M HEPES is shown to restrict pH variation to within 0.5 pH units over 10 days without adversely affecting Chlorella growth or Daphnia growth and fecundity. A bioassay of the reduction in 48 h acute toxicity of cadmium to Daphnia in media containing each potential chelating agent in turn is used. These data indicate that 0.001M HEPES buffer does not complex cadmium at 0.1 ppm, and that ferri-gluconate is less likely to do so than ferri-EDTA. (EIS-Katz)
W79-02972

ACUTE TOXICITY OF MERCURY AND SELENIUM TO CRASSOSTREA GIGAS EMBRYOS AND CANCER MAGISTER LARVAE.
Moss Landing Marine Labs., CA.
N. Glickstein.
Marine Biology, Vol. 49: 1978. p 113-117, 3 tab, 1 fig, 23 ref.

Descriptors: *Metals, Toxicity, Bioassay, Laboratory tests, Mortality, Oysters, Crabs, Molluscs, Crustaceans, *Mercury, *Selenium, *Antagonism, *Additive toxicity, Statistical analysis, Juvenile stages, Sea water.

The possible modification of mercury toxicity by selenium in embryos of the Pacific oyster Crassostrea gigas and the larvae of the crab Cancer magister was investigated. Mercury concentration eliciting abnormal development in 50% of the oyster embryos (EC50) was 5.7 micrograms/liter -1 (48 h) and mortality in 50% of the crab larvae (LC50) occurred with 6.6 micrograms/1 -1 (96 h). The 48 h EC50 for selenium was greater than 10,000 micrograms/1 -1 for oyster embryos and the 96 h LC50 for crab zoeae was 1040 micrograms/1 -1. The response from each species, when exposed to both toxicants, revealed that a high level of selenium (> or equal to 5,000 micrograms/1 -1) increased mercury toxicity. Moderate selenium concentrations (10 to 1,000 micrograms/1 -1) tended to decrease mercury toxicity, although no statistical verification could be made. The order of administration of toxicants had no effect on the response of Crassostrea gigas embryos. Early developmental stages (< of equal to 8 h) of C. gigas embryos were most sensitive to dissolved Hg; toxicant administration 24 h after fertilization resulted in no apparent abnormalities in development. (EIS-Katz)
W79-02973

INTERACTIONS OF METHYLMERCURY, CADMIUM, AND SALINITY ON REGENERATION IN THE FIDDLER CRABS UCA PUGILATOR, U. PUGNAX AND U. MINAX,
Rutgers - The State Univ., Newark, NJ. Dept. of Zoology and Physiology.
J. S. Weis.
Marine Biology, Vol. 49, 1978. p 119-124, 3 fig, 24 ref.

Descriptors: *Methylmercury, *Cadmium, *Salinity, Crabs, Fiddler crabs, *Bioassay, Laboratory tests, Animal physiology, Animal behavior, Additive toxicity, Metals, Water pollution effects, Methodology, Calcium, Antagonism.

After multiple autotomy in the fiddler crabs Uca pugilator, U. pugnax and U. minax, both methylmercury and cadmium retard limb regeneration and ecdysis. When crabs in sea water are exposed to a mixture of both metals, the effect is increased, indicating that the two are interacting in an additive way. In 50% sea water (=15% S), the effects of cadmium are greatly intensified so that growth of limb buds is extremely slow, if it occurs at all. When methlymecury is present in the water at the same time, the severe effects of cadmium are somewhat ameliorated, indicating an antagonistic interaction of the two metals under these conditions. Adding additional calcium to the 50% sea water also decreased the severity of the cadmium effect, thus supporting the idea of a calcium-cadmium competition. (EIS-Katz)
W79-02974

NUTRIENT REGENERATION BY ZOOPLANKTON DURING A RED TIDE OFF PERU, WITH NOTES ON BIOMASS AND SPECIES COMPOSITION OF ZOOPLANKTON,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
S. L. Smith.
Marine Biology, 49, p 125-132 (1978) 4 tab, 5 fig, 19 ref.

Descriptors: *Nutrients, *Zooplankton, *Phytoplankton, *Red Tide, Dinoflagellates, Gymnodinium, Chlorophyll, Peru, Biomass, *Primary productivity, Copepods, Crustacean, Nitrogen compounds, Nitrogen cycle, Salinity, Water temperature.

During March and April 1976, a red tide, dominated by the dinoflagellate Gymnodinium splendens Lebour, developed off Peru. At the height of the bloom, the euphotic zone was 6 m deep and the chlorophyll a at the surface was 48 micrograms/l -1. A daily collection of zooplankton at 09.00 hrs showed large fluctuations of biomass, from 0.2 to 3.84 g dry weight m-2 in a water column of 120 m. Copepodids and nauplii dominated the collections. During a period of reduced wind, the adult copepods were a mixture of the species characteristic of the coastal upwelling system and the neritic species associated with more northerly, tropical waters. Nitrogen regeneration by the zooplankton varied with the development of the bloom, the type of zooplankton dominating the experiment, and biomass fluctuations, but never accounted for more than 25% of the nitrogen uptake by phytoplankton. (EIS-Katz)
W79-02975

HATCHERY ALARM SYSTEM TO PROTECT AGAINST CATASTROPHIC EGG OF FISH KILLS,
National Fish Hatchery White Sulphur Springs, WV.
For primary bibliographic entry see Field 5G.
W79-02977

POLYCHLORINATED BIPHENYLS: TRANSFER FROM MICROPARTICULATES TO MARINE PHYTOPLANKTON AND THE EFFECTS ON PHOTOSYNTHESIS,
Stanford Univ., Pacific Grove, CA. Hopkins Marine Station.
L. W. Harding, Jr., and J. H. Phillips, Jr.
Science, Vol. 202, 15 Dec. 1978, p 1189-1192. 2 tab, 3 fig, 25 ref.

Descriptors: Aroclor, *Polychlorinated biphenyls, Phytoplankton, *Marine phytoplankton, Photosynthesis, *Primary production, *Diatoms, Algae, Plant physiology, Particle size, Sediments, Path of pollutants, *Water pollution effects, Chlorophyll, Bioassays.

Polychlorinated biphenyls (PCB's) initially associated with micro-particulates are incorporated into marine diatom cells. The time course of transfer is rapid; equilibrium is attained within several hours. Assays with chlorophyll a fluorescence in vivo indicate that the transferred PCB's reach sites in the photosynthetic machonery that are sensitive to the effects of these compounds. (EIS-Katz)
W79-02978

SELENIUM METABOLISM IN THE MARINE PHYTOPLANKTERS TETRASELMIS TETRATHELE AND DUNALIELLA MINUTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
J. J. Wrench.
Marine Biology, Vol. 49, p 231-236, 1978. 2 tab, 3 fig, 15 ref.

Descriptors: Phytoplankton, Marine phytoplankton, *Selenium, *Plant physiology, Plant biochemistry, Plant metabolism, Radioactivity, *Radio active selenium, Radioisotopes, Radioactivity techniques, Water pollution effects, Path of pollutants, *Food chains.

Radioactive selenite-75 has been used to investigate the metabolic transformation of inorganic selenium by the marine phytoplankters Tetraselmis tetrathele and Dunaliella minuta. The majority of radioselenium taken up from culture media during growth becomes associated with cellular protein. A small quantity of this protein-bound selenium can be volatilised by treatment with strong acid, suggesting the presence of hydrogen selenide. However, the principal fraction of selenium appears to be integrated into the primary protein structure. Enzymic hydrolysis of phytoplankton protein and subsequent chromatography of hydrolysates revealed the presence of seleno-analogues of the sulphur amino acids. Selenium amino acids were also detected in non-protein extracts. (EIS-Katz)
W79-02979

PHYTOPLANKTON AND COOLING SYSTEMS: TEMPERATURE EFFECTS USING DIFFERENT INTAKE AND DISCHARGE DEPTHS,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
J. W. McMahon, and A. E. Docherty.
Water Research, Vol. 12, 1978, p 925-929, 1 tab, 2 fig, 17 ref.

Descriptors: *Phytoplankton, *Water temperature, Water pollution effects, Plant pathology, Plant physiology, Plant populations, Power plants, *Thermal pollution, Thermal power, *Thermal power plants, Thermal stratification, Thermal water, Water circulation, Waste treatments, On-site investigations, Lakes, *Phytoplankton species succession, Dissolved oxygen, Diatoms.

The effect of depth of intake and controlled discharge of heated waters (T-10 degrees C) on a natural phytoplankton community in a cold water lake was studied using polyethylene enclosures. Changes in plankton species composition and cell concentrations were used as indicators of temperature effects. Of three intake-discharge arrangements studied (surface intake-surface discharge; deep intake-deep discharge; deep intake-surface discharge) only the first design produced statistically significant increases in plankton numbers. A deep intake-surface discharge resulted in the least biological and physical changes in the lake water. Phytoplankton species succession in the heated water was similar to patterns observed in the open lake. (EIS-Katz)
W79-02980

EFFECTS OF SALINITY ON SYNTHESIS OF DNA, ACIDIC POLYSACCHARIDE, AND GROWTH IN THE BLUE-GREEN ALGA, GOMPHOSPHAERIA APONINA,
University of Southern Florida, Tampa. Dept. of Chemistry.
D. F. Martin, and M. H. Gonzalez.
Water Research, Vol. 12, 1978. p 951-955. 1 tab, 2 fig, 29 ref.

Descriptors: *Algae, Plant physiology, Plant nutrition, Plant biochemistry, Enzymes, *Salinity, Water quality, Sea water, Artificial sea water, Laboratory tests, Growth rates, *DNA, Carbohydrates, *Polysaccharide synthesis, Gomphosphaeria, Growth rates, *Cyanophata.

A blue-green alga, Gomphosphaeria aponina, was grown in artificial sea water at salinities 20-36%. Fair to good growth was obtained at al salinities, and growth constants (Ke) were obtained. A parabolic relationship was obtained for the growth salinity relationship, e.g. (S-Smax)2 = -2p(Ke-K'e), where S and Smax is the given salinity and the maximum salinity, respectively, for which growth constants Ke and K'e were obtained; P is a constant. The rate of DNA synthesis increased linearly with growth constant above Ke = 0.95 day-1. Linear correlation coefficients were obtained for rate of polysaccharide synthesis and the rate of DNA synthesis, as well as for the rate of DNA synthesis and the rate of synthesis of aponin. The latter is material isolated from G. aponina and has cytolytic activity toward the Florida red tide organism, Gymnodinium breve, an unarmoured dinoflagellate. (EIS-Katz)
W79-02981

BIOACCUMULATION POTENTIAL OF POLYCYCLIC AROMATIC HYDROCARBONS IN DAPHNIA PULEX,
Oak Ridge National Lab., TN.
G. R. Southworth, J. J. Beauchamp, and P. K. Schmieder.
Water Research, Vol. 12, 1978, p 973-977. 2 tab. 2 fig., 15 ref.

Descriptors: Absorption, Daphnia, Crustaceans, Zooplankton, Oil, Oil spills, Water pollution effects, Path of pollutants, Bioassay, Laboratory tests, Methodology, *Polyaromatic, Aromatic hydrocarbons, *Naphthalene, *Anthracene, *Phenanthrene, *Pyrene, *9-methylanthracene, *Benz(a)anthracene, *Perylene, *Bioaccumulation, Bioaccumulation kinetics, Animal physiology, Model studies.

The bioaccumulation potentials by aquatic biota from aqueous solution were determined for seven polycyclic aromatic hydrocarbons (PAH). The PAH were tested using Daphnia pulex and consisted of the following compounds: naphthalene, anthracene, phenanthrene, pyrene, 9-methylanthracene, benz(a)anthracene and perylene. Bioaccumulation kinetics were described as a first order approach to equilibrium in a two-compartment model (water and Daphnia), using a two-stage technique to estimate uptake and elimination rates, while accounting for decreasing aqueous concentrations. Estimates of equilibrium concentration factors were obatined by two methods: (1) evaluating the kinetic model as t tends to infinity and (2) direct measurement of concentration factor at t = 24h. Estimations of equilibrium concentration factors obtaned by the two methods we in good agreement, and increased dramatically with increasing molcular weight within the series of compounds. The calculated n-octanol-water partition coefficient was shown to be a good predictor of bioaccumulation potential of PAH in Daphnia. PAH were concentrated from a high of about 10,000-fold for benz(a)anthracene to a low of about 100-fold for naphthalene. (EIS-Katz)
W79-02982

PLANT COMPETITION FOR ATRAZINE,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W79-02985

A MEASURE OF RESPONSE TO PERTURBATION USED TO ASSESS STRUCTURAL CHANGE IN SOME POLLUTED AND UNPOLLUTED STREAM FISH COMMUNITIES,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-02996

CORRELATIONS OF FISH CATCH AND ENVIRONMENTAL FACTORS IN THE GULF OF MAINE,
Bedford Inst. of Oceanography, Darthmouth(Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W79-02997

THE PRESENCE OF POLLUTANT HYDROCARBONS IN ESTUARINE EPIPELIC DIATOM POPULATIONS,
Bristol Univ. (England). School of Chemistry.
S. Thompson, and G. Eglinton.
Estuarine and Coastal Marine Science, vol. 4, p. 417-425, 1976. 3 fig., 2 tab., 18 ref.

Descriptors: *Organic compounds, Analytical techniques, *Solvent extractions, *Estuaries, Sediments, Laboratory tests, Metabolism, Path of pollutants, *Diatoms, Absorption, Animal physiology, Environmental effects, Chromatography, Mass spectrometry, Biochemistry, *Oil pollution, *Oil spills, Pollutant identification, Bioaccumulation, Gyrosiqma sp., Nitzchia sp., Nereis sp., Epipelic diatoms, *Seven Estuary(England).

The presence of a complex mixture of aliphatic hydrocarbons in the organic extracts of 3 populations of estuarine epipelic diatoms was reported. The aliphatic hydrocarbon distributions were resolved by capillary gas chromatography and by computerized gas chromatography/mass spectrometry and were shown to be similar to the characteristic crude oil-type sliphatic hydrocarbon distribution found in the estuarine sediment. Crude oil-type polynuclear aromatic hydrocarbons found in the sediment were not present in the diatoms. The possible pathways of selective incorporation of pollutant hydrocarbons into epipelic diatoms and the environmental significance of the process were discussed. (Katz)
W79-02998

5D. Waste Treatment Processes

BILGE WATER TREATMENT WITH A TABULAR ULTRAFILTRATION SYSTEM,
David W. Taylor Naval Ship Research and Development Center, Bethesda, MD.
L. R. Harris, D. F. Jackson, and P. Schatzberg.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 328, Price codes: A03 in paper copy, A01 in microfiche. Report No. DTNSRDC-76-0056, October 1976. 36 p, 11 fig, 5 tab, 11 ref, 2 append.

Descriptors: *Membrane processes, *Separation techniques, *Ultrafiltration, Water treatment, Waste water treatment, Oil spills, Detergents, Cellulose, Waste water, Flux rates, Oil wastes, Olly water, Bilge water, Filtration.

Results of an investigation evaluating the effectiveness of cellulosic (Type A) and noncellulosic (Type D) tubular ultrafiltration (UF) membranes in separating various oils from water are presented. Two commercially available tubular UF membranes, having the same geometry and the same pore size, and three oils were selected for the investigation. It was found that: the type D provided higher UF rates (flux) than the type A, and that the D membrane removed oil in the presence of detergent; removal of oil from water to less than 15 mg/l was achieved with either membrane; flux declining resulting from exposure to bilge water was recovered completely through membrane cleaning with type D only; cumulative irreversible flux decline occurred with type A upon exposure to bilge water; and high removal efficiencies of some dissolved metals found in bilge water was achieved with both membrane types. A schematic diagram of the UF test system is provided. (Davison-IPA)
W79-02502

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION, VOLUME 1: IN-PLANT CONTROL OF POLLUTION.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 429, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-625/3-74-004, October 1974. Vol. 1 of 2. 121 p, 18 fig, 52 tab, 11 ref, 2 append.

Descriptors: *Textiles, *Water pollution, *Air pollution, *Waste water treatment, *Effluents, *Industrial wastes, Chemical wastes, Liquid wastes, Waste water disposal, Recycling, Bleaching wastes, Solid wastes, Solutes, Water requirements, Water Quality Act, Pollution abatement, Water pollution abatement, Solvents, Surveys, Water pollution sources, Water reuse, Flow control, Water conservation.

Water pollution abatement and air pollution abatement are discussed in this first volume of a two volume series on reducing pollution in the textile industry. As a first step in water pollution abatement waste water is characterized by a waste survey involving a preliminary survey, a detailed survey, a data evaluation, and continued monitoring. Major sources of wastes in textile operations are process effluents from: (1) wool scouring, (2) wool finishing, (3) geige goods mills, (4) woven fabric finishing, (5) knit fabric finishing, (6) carpet mills, (7) stock and yarn dyeing and finishing, and (8) specialized finishing. Other areas of water pollution abtement considered are: water reuse, flow reduction, waste segregation, and pretreatment of textile wastes. A panel discussion on the inplant control of pollution examined the substitution of processes and materials. Case histories are used to illustrate programs for water conservation. It is recommended that waste water be segregated so that only dirty water is sent to lagoons, while the more-or-less clean water be used in the dirtier processes. Pretreatment of textile wastes, necessary for protection of the treatment system, involves screening for lint, fiber removal and pH regulation of highly alkaline wastes. It is further recommended that the use of each chemical and its impact on pretreatment, treatment, ecology, and end disposal be thoroughly reviewed. The discussion of air pollution abatement concentrates on an emissions survey, particulate control and solvent recovery. (See also W79-02505) (Daivson-IPA)
W79-02504

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION VOLUME 2; WASTEWATER TREATMENT SYSTEMS.
Metcalf and Eddy, Inc., Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 566, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-625/3-74-004, October 1974. Vol. 2 of 2. 49 p, 10 fig, 7 tab, 4 ref.

Descriptors: *Textiles, *Waste water treatment, *Biological treatment, *Activated carbon, Cost analysis, Aerobic treatment, Trickling filters, Activated sludge, Aeration, Lagooning, Water pollution, Water pollution control, Water pollution abatement, Water quality control, Water treatment, Effluents, Industrial wastes, Chromium, Copper, Mercury, Zinc.

The constantly changing manufacturing processes and resulting waste waters of the textile industry necessitate continued monitoring and upgrading of the waste water treatment systems. The sources of pollution in textile process waste waters include the natural impurities extracted from the fiber along with the processing chemicals, which are either discharged directly or leached during rinsing; traces of the heavy metals, chromium, copper, zinc and mercury, are often found in these waste waters. Biological waste water treatment and granular activated carbon treatment are presented, together with case histories, as effective waste water treatment systems currently being used. Biological treatment methods include: trickling filters, activated sludge, rotating biological disks, extended aeration, and lagoons. The granular activated carbon treatment, relatively new to the textile industry, involves filering the orgaic chemicals from waste waters by passing the water through a bed of carbon, whereby the chemicals are held back by Van de Waals forces, while the water continues to flow through the carbon free of organic contaminants. Construction costs for three common biotreatment methods are presented, and the economics of the granular activated carbon method are discussed. (See also W79-02504) (Davison-IPA)
W79-02505

THE U-TUBE FOR WATER AERATION,
Rocketdyne, Canoga Park, CA.
R. C. Mtichell, and A. D. Lev
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 688, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. R-8043, march 1970. 171 p, 55 fig, 16 tab, 28 ref, 4 append. D1-14-12-434.

Descriptors: *Waste treatment, *Aeration, *Sewage treatment, Waste water treatment, Models, U-tubes, Oxygen, Effluents, Design criteria, Water pollution treatment, Prototype tests, Analytical techniques, Prototypes, Jefferson Parish, Louisiana.

Complete results of the experimental and analytical investigation and the development of the U-tube aeration concept for waste water applications are presented. The three major tasks completed were: (1) experimental verification of oxygen transfer efficiencies and exploration of practical aspects of U-tube operation; (2) analytical investigation of the two key applications -- post aeration of effluent from a sewage treatment plant and in-site aeration of sanitary sewer flows to prevent anaerobic conditions; (3) investigation and design of prototype U-tube systems emphasizing designs for installation in the Jefferson Parish, Louisiana, sewer system. Mass transfer and fluid dynamics behavior of a representative prototype U-tube system for long ranges of design variables and operating conditions are characterized through experimental data. An analytical model of the system is described, and

then applied, using experimental data, to predict performances and operating characteristics of large-scale U-tube systems in various applications. It was found that the U-tube technique is a practical, flexible efficient method, particularly suited to applications for raising the dissolved oxygen concentration of a moving stream. Flexibility in the choice of configurations and other variables allow efficient specific designs in many applications and requirements. Advantages of U-tube aeration systems include: require little space; can be designed with no moving parts; require no operating labor and little maintenance; and have substantial cost savings over conventional aeration methods. (Davison-IPA)
W79-02506

FEDERAL GUIDELINES: INDUSTRIAL COST RECOVERY SYSTEMS, MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W79-02508

ELIMINATION OF WATER POLLUTION BY RECYCLING CEMENT PLANT KILN DUST,
Portland Cement Association, Skokie, IL.
N. R. Greening, F. M. Miller, C. H. Weise, and H. Nagoo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 080, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-194, July 1976. 68 p, 10 fig, 24 tab, 9 ref. 802196.

Descriptors: *Portland cements, *Separation techniques, *Chemical reactions, Alkali-aggregate reactions, Water pollution, Waste water treatment, Neutralization, Alakli metals, Spraying, Dusts, Industrial wastes, Pyroprocessing techniques.

The feasibility of separating cement plant kiln dust into alkali-rich and alkali poor fractions using fluidized bed, flame-spary and other pyroprocessing techniques was investigated. The effect of varying a number of process parameters on the achievement of the four following goals was studied: (1) effective feeding of the kiln dust raw material; (2) maintenance of flame stability and of adequate temperature to achieve alkali volatilization; (3) achievement of separation of these two fractions until collection was complete; and (4) efficient collection of the two kiln dust fractions. Variations in the process parameters included: the feeding system and fluidizing arrangement; the portion of the system designed for alkali entrapment; the dust collection mechanism; the temperature of the flame and collection system; and the collecting medium. The first two goals were achieved, and after optimization of al the process parameters all goals were achieved. Suggestions for the achievement of the goals in other ways were made after a theoretical study of the operative chemical was made. (Davison-IPA)
W79-02509

CHITOSAN -- A POLYMER FROM SEAFOOD WASTE, FOR USE IN TREATMENT OF FOOD PROCESSING WASTES AND ACTIVATED SLUDGE,
Georgia Univ., Athens, Coll. of Agriculture Experiment Stations.
W. A. Bough.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 078, Price codes: A04 in paper copy, A01 in microfiche. Report No. NOAA-76040901, 5 p, 2 fig, 9 tab, 13 ref. SG-04-5-158-4.

Descriptors: *Chitosan, *Waste treatment, *Food processing industry, *Water pollution, Shellfish, Shrimp, Crab, Coagulation, Activated sludge, Proteins, Polymers, Byproducts, Waste water treatment, Effluents, Water conservation, Food wastes, *Carbohydrates(High molecular weight).

The use of chitosan, a high molecular weight carbohydrate processed from the chitin in shrimp and crab wastes, as a coagulating agent in the treatment of food wastes is discussed. Its use in vegetable processing wastes, poultry processing wastes, egg breaking wastes, activated brewery sludge, activated vegetable sludge, meat processing and curing wastes, shrimp processing wastes and fruit cake wastes are examined. Results of a comparison of the coagulated byproducts obtained from food processing wastes suggest that chitosan would be useful as an agent for reducing waste loads and for byproduct recovery. The recovered protein byproduct also has a potential use as protein in animal feeds. Chitosan was shown to be equal to, or better than other commercially available polymers in performance. (Davison-IPA)
W79-02513

ELECTROCHEMICAL BIOCIDE,
Life Systems, Inc., Cleveland, OH.
C. A. Bodo, G. G. See, and R. A. Wynveen.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A028 304, Price codes: A04, A01 in microfiche. Annual Report No. LSI-ER-221-23, May 1976. 52 p, 21 fig, 5 tab, 3 ref. DAMD17-74-C-4102.

Descriptors: *Waste water treatment, *Sewage treatment, *Disinfection, *Microorganisms, Aquatic microorganisms, E. coli, Bacteria, Electrodes, Equipment, Sewage, Electrochemistry, Electric reactors, Water purification, Electrolysis.

An alternate raw sewage treatment method called an Electrochemical Biocide is discussed. The process utilizes low level voltages at chemically-inert electrodes to pass alternating current through the water to destroy microscopic flora. Objectives of this research and development program included: a demonstration of process feasibility; expansion of the Electrochemical Biocide reactor design; determination of the engineering parameters affecting process effectiveness and efficiency; establishment of hypothesis for the microorganism kill mechanism; and recommendations for scaling the process to the requirements of the U.S. Army Medical Research and Development Command and National Aeronautics and Space Administration. The test hardware and process are detailed. Results showed that the microorganisms were completely destroyed. Ten specific direct conclusions and three indirect conclusions resulting from the current research are presented and include: an electrical frequency of less than one cycle per second enhances the effectiveness in destroying microorganisms; the process is more effective in treating sewage water than test water due to the generation of chlorine and hypochlorite; E coli was the cost resistant bacterium; improvement in process performance resulted from increased mass transfer, closer electrode spacing and reduced electrical frequencies; and destruction of the microorganisms takes place at or near the electrode for unbuffered test water without sodium chloride. Further testing is recommended. (Davison-IPA)
W79-02514

FINANCIAL IMPLICATIONS OF WASTE MANAGEMENT SYSTEMS FOR SHELLFISH PROCESSING,
Georgia Univ., Athens.
For primary bibliographic entry see Field 5G.
W79-02516

FEASIBILITY OF THE FUNCTIONAL USE OF VEGETATION TO FILTER, DEWATER AND REMOVE CONTAMINANT FROM DREDGED MATERIALS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W79-02517

UPGRADING DIARY PRODUCTION FACILITIES TO CONTROL POLLUTION -- IN-PLANT CONTROL OF WASTE,
Cornell Univ., Ithaca, NY. DePt. of Food Science.
For primary bibliographic entry see Field 5G.
W79-02518

UPGRADING DAIRY PRODUCTION TO REDUCE POLLUTION -- CHOOSING THE OPTIMUM FINANCIAL STRATEGY FOR POLLUTION CONTROL,
Commins (J. A.) and Associates, Inc., Fort Washington, PA.
For primary bibliographic entry see Field 5G.
W79-02519

SOME IMPACTS OF SAFE DRINKING WATER STANDARDS ON RURAL WATER SYSTEMS,
Mississippi State Univ., Mississippi State. Div. of Business Research.
For primary bibliographic entry see Field 5G.
W79-02522

EFFECT OF MERCURY ON NADH AND THE PROTECTIVE ROLE OF OXALACETATE,
Georgia Univ., Athens. Dept. of Food Science.
M. K. Hamdy, and O. R. Noyes.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 1, p 112-120, 1977. 2 fig, 1 tab, 16 ref. OWRT B-069-GA(4), 14-31-0001-3870.

Descriptors: *Mercury, Metals, Water Pollution Sources, *Toxicity, Bacteria, *Bioindicators, Biological treatment, *Indicator bacteria biocontrol, *Microbial degradation, Absorption, *Biotransference, Biological uptake, Bacillus lickeninformis, Detoxification, Aquatic environment, *Malate, *Methylmercury, *Oxalacetate.

Effect of mercury chloride (HgCl2) and methylmercury (CH3HgCl) on malate (MDH) and lactate (LDH) dehydrogenases isolated from a mercury-resistant Enterobacter aerogenes was examined. Assays of enzymes were conducted spectrophotometrically at 340 nm. Results showed that the presence of 0.03 micro M CH3HgCl per 3 ml reaction mixture inhibited 12 and 67% of LDH activities, respectively; whereas, 0.03 micro M HgCl2 inhibited 48% of MDH activities. The inhibition was due in part to interaction between HgCl2 and the coenzyme moiety (NADH) of both enzymes as evidenced from changes in spectral characteristics of NADH. Concentration (0.1 micro M/reaction mixture) of other compounds CdSO4, ZnSO4 or CH3HgCl had no effect on NADH. The addition of 0.02 micro M oxalacetate (OAA) but not tartarate, succinate, pyruvate or malate, restored the spectral characteristics of 0.02 micro M NADH. It is suggested that the enol form of DAA (10% at ph 7.0) combines with Hg++ to form a salt complex and thus removes Hg++ from NADH-Hg++ complex. A 10-fold increase in concentration of OAA as compared to HgCl2 is required to protect NADH from the action of mercurials and restore its biological properties and function.
W79-02596

A FIELD STUDY OF TREATMENT VS. DEPTH OF SAND FILL IN A MOUND SYSTEM,
Maine Univ. at Orono. Land and Water Resources Inst.
S. D. Couture.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 392, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, May 1978. 92 p, 27 fig, 6 tab, 38 ref, append. OWRT A-040-ME(1).

Descriptors: Aerobic conditions, Chemical oxygen demand, Coliforms, *Denitrification, Effluents, Groundwater, Nitrates, Nitrification, Nitrogen, *Phosphorus, *Septic tanks, Topsoil, *Waste water treatment, *Waste disposal, Ammonia nitrogen, Fecal coliform, Mound on-site waste disposal systems, Organic nitrogen, Total dissolved phosphorus.

A field study was performed using a mound system designed and constructed to treat septic tank effluent in an area of seasonally high groundwater. The

objective was to measure the treatment of septic tank effluent versus depth of sand fill below the adsorption trench. The system was monitored during four sampling periods (8/77, 9/77, 10/77, and 11/77) for concentrations of soluble COD, total dissolved phosphorus, organic nitrogen, ammonia nitrogen, nitrate, and fecal coliform. Essentially complete removal of total dissolved phosphorus was found to occur within the first six inches of sand fill. Complete removal of the fecal indicator organisms occurred before the treated water intercepted the groundwater table. The internal clay barrier in the toe of the mound prevented ponded effluent from seeping out of the toe. It was concluded that the first six inches of the sand fill below the adsorption trench was aerobic and the lower portion of the sand fill below the adsorption trench and the original underlying soil were anaerobic. The situation of aerobic fill/anaerobic topsoil allowed for nitrification and denitrification to occur within the mound fill and underlying soil.
W79-02604

THE EFFECT OF TEMPERATURE ON TREATMENT PLANT PERFORMANCE AND RELATED TEMPERATURE STUDIES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
J. J. McKeown, A. Benedict, D. Buckley, and K. Dussik.
NCASI Stream Improvement Technical Bulletin, No. 312, 82 p, May, 1978. 34 fig, 12 ref, 17 ref, append.

Descriptors: *Pulp wastes, *Waste water treatment, *Temperature, *Aerated lagoons, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Heat balance, Foaming, Biological treatment, Biochemical oxygen demand, Suspended solids, Thermal insulation, Effluents.

Based on information provided by more than 60 pulp and paper mills currently participating in the continuing treatment plant performance analysis project maintained at the NCASI northeast regional center, this study on the effect of temperature on effluent treatment showed that heat loss in aerated stabilization basin systems is a function of surface area exposed to the atmosphere, independent of surface aerator horsepower intensity, and is affected by foam which acts as a thermal insulation barrier. The temperature of the biological reactor was a major factor in final effluent BOD and suspended solids concentrations and was predictable within the monthly average extremes of 5 and 40C. The correlation between temperature and BOD reduction was found to be adequate to incorporate predictive modeling. The same was not true for suspended solids, however, although within a single treatment system a rise in BOD concentration generally resulted in a rise in suspended solids concentration. (Swichtenberg-IPC)
W79-02618

NUTRIENTS, TOXINS, AND WATER IN TERRESTRIAL AND AQUATIC ECOSYSTEMS TREATED WITH SEWAGE PLANT EFFLUENTS - FINAL REPORT OF THE UPLAND RECHARGE PROGRAM,
Marine Biological Lab., Woods Hole, MA.
G. M. Woodwell, J. T. Ballard, J. Clinton, and E. V. Pecan.
Brookhaven National Laboratory, Report BNL 50513, 39 p, January 1976. 10 fig, 12 tab, 11 ref, 2 append.

Descriptors: *Sewage treatment, *Aquatic plants, *Deciduous trees, *Nutrients, Sewage effluents, Water quality, Water analysis, Ecosystems, Plant populations, Percolating water, Percolation, Phosphorus, Iron, Marshes, Marsh plants, Waste treatment, Water treatment, *Sere.

The objective was to appraise the capacity of terrestrial and aquatic plant communities for absorbing and retaining nutrients and organic matter in sewage and for releasing 'clean' water. The results showed the following: (1) Under normal circumstances, without the addition of water or nutrients in sewage, the flux of nutrients into the groundwater was greatest under the agricultural communities and least under the late successional forest communities; (2) The highest concentrations of nutrients in the percolate of the untreated communities commonly occurred in the earliest stages of succession; (3) Treatment with sewage reduced the differences in concentration in the percolate between the communities of the sere; (4) Calculation of the budgets of the various ecosystems showed that the forested stages accumulated the largest fractions of the inputs; (5) Appreciable changes occurred in the quality of percolate under the controlled communities over the period of the experiment; and (6) Present indications are that if sewage-treatment systems using natural communities are to be devised, they will require combinations of aquatic and terrestrial systems. (EIS-Deal)
W79-02638

ANALYSIS OF MODELS FOR DICHLORAMINE REMOVAL BY ACTIVATED CARBON IN BATCH AND PACKED-BED REACTORS USING QUASILINEARIZATION AND ORTHOGONAL COLLOCATION METHODS,
Illinois Univ. at Urbana-Champaign. Dept. of Chemical Engineering.
B. R. Kim, R. A. Schmitz, V. L. Snoeyink, and G. W. Tauxe.
Water Research, Vol. 12, p 317-326, 1978. 5 fig, 2 tab, 17 ref. S-051-ILL

Descriptors: *Activated carbon, Chlorination, Nitrogen chemical reactions, Chemical reduction, Model studies, Waste water treatment, *Mathematica models, *Dichloramine, Dechlorination, Chlorine residuals.

The reaction between dichloramine and activated carbon in batch and packed bed reactors has been described by a mathematical model involving proe transport and surface reaction rate as rate limiting steps. The poisoning of the surface resulting from the build-up of reaction products on the surface has also been taken into account. The orthogonal collection method was successfully used to solve models. Quasilinearization was used to determine necessary constants from batch reactor data, and these constants were used to accurately predict breakthrough curves for packed bed reactors.
W79-02640

DISSOLVED-OXYGEN REGIMEN OF THE WILLAMETTE RIVER, OREGON, UNDER CONDITIONS OF BASINWIDE SECONDARY TREATMENT,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5G.
W79-02657

POLYMER COAGULATION OF HUMIC ACID WATERS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
J. K. Edzwald, J. D. Haff, and J. W. Boak.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE6, p 989-1000, December 1977 12 fig, 15 ref.

Descriptors: *Water supply, *Waste water treatment, *Flocculation, *Coagulation, *Polymers, Color, Humic acids, Environmental engineering, Alum, Effects.

The removal of color from water supplies using alum, polymers, and alum-polymer combinations is described. Humic acid was used as the natural color colloid and the results indicate that: (1) Alum alone requires relatively high dosages; (2) low molecular weight cationic polyelectrolytes used alone chemically interact with humic acid; and (3) alum combined with high molecular weight polymers is an effective coagulation process. Stoichiometry between the raw water humic acid concentration and the optimum coagulant dosage is reviewed. Experimental results are used to examine the stability of humic acid and mechanisms of particle destabilization. (Bell-Cornell)
W79-02715

A FRESH WATER WASTE RECYCLING-AQUACULTURE SYSTEM,
Harbor Branch Foundation, Inc., Fort Pierce, FL
J. H. Ryther, L. D. Williams, and D. C. Kneale.
Florida Scientist, Vol. 40, No. 2, p 130-135, Spring, 1977. 1 fig, 1 tab, 14 ref.

Descriptors: *Aqiculture, *Biological treatment, *Waste water treatment, *Nutrient removal, *Sewage effluents, Fish, Shrimp, Algae, Phytoplankton, Nitrogen, Phosphrous, Biomass, Grass carp.

The treatment system was tested during the period 3 March 1975-29 August 1975 in two 11 x 4 x 0.6 m (25,000 l) PVC-lined earthen ponds. One pond was inoculated with the macroscopic alga Chara sp. Undiluted secondary effluent was passed through this pond at a rate of 500 l/day providing a turnover rate of 2% of the pond volume/day. Removal efficiencies for nitrogen and phosphorus were 83 and 87%, respectively. The second pond was stocked with 28 juvenile (20 g) grass carp. The fish were fed the harvest growth of the Chara. During the study period fish biomass showed an increase of 4.5 kg. Seventy-five juvenile (1.7 g) fresh water shrimp were added to the second pond to utilize potential food wastes from the inefficient grass carp. Shrimp biomass increased 1.2 kg during the study period. Problems encountered with this system were difficulty in handling Chara without retarding its growth and dense phytoplankton blooms. (Stihler-Mass)
W79-02759

CHEMICAL TREATMENT FOR ORGANIC COLOR REMOVAL FROM GROUNDWATERS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
J. E. Bowie, Jr
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 209, Price codes: A12 in paper copy, A01 in microfiche. Doctoral Dissertation, August 1978. 244 p, 65 fig, 12 tab, 100 ref, 3 append. OWRT A-084-MISS(3), 14-31-0001-5024.

Descriptors: *Waste water treatment, *Chemical precipitation, *Water treatment, *Color, *Groundwater, *Chemical reactions, *Water purification, Coagulation, Flocculation, Oxidation, Reduction, Ultraviolet radiation, *Humic acids, Hydrogen ion concentration, Alum, Sodium sulfite, Cations, Ozone, Hydrogen peroxide, Polyelectrolytes.

A chemical treatment system for removing highly colored humic acid type compounds from water was developed. Four types of systems were tested: chemical precipitation-coagulation, oxidation/reduction, photo-oxidation/reduction, and polymerization. Both divalent and trivalent cationic precipitation coagulation systems were examined in which the color-causing organics are actually physially removed from the system. Trivalent cations were more efficient than divalent ones requiring only 1/10 the dosage for complete color removal and zeta-potential neutralization. A system was developed combining addition of alum and cationic polyelectrolyte and adjustment of pH to 5.5. The order of chemical addition, rapid mix, and flocculation stages of this system were optimized and the results tabulated. Of the oxidation and reduction treatments studied, only oxidation by ozone and hydrogen peroxide were effective in reducing color. Ultraviolet light treatment alone was ineffective, but irradiation with ultraviolet accelerate oxidation/reduction reactions and drive some reactions closer to completion. Ultraviolet was especially effective when used with sodium sulfite reduction, which alone was unreactive. Polymerization was totally unacceptable as a color remover It is recommended that further research be done on four methods: (1) chemical precipitation-coagulation with or without polyelectrolytes, (2) ozonation; (3) ultraviolet light-air treatment with or without hydrogen peroxide; (4) ultraviolet light -

sodium sulfite treatment in inert atmosphere. (Majtenyi-IPA)
W79-02782

TECHNICAL GUIDELINES FOR PUBLIC WATER SYSTEMS.
Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5G.
W79-02787

PROGRAM IMPLEMENTATION PROCEDURES: IMPLEMENTATION OF TWO YEAR POST HIGH SCHOOL WASTEWATER TECHNOLOGY INSTRUCTIONAL PROGRAMS.
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5G.
W79-02789

A CHEMICAL AND BIOLOGICAL EVALUATION OF THREE MINE DRAINAGE TREATMENT PLANTS,
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
S. C. McPhilliamy, and J. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 453, Price codes: Ao5 in paper copy, A01 in microfiche. June 1973. 81 p, 6 fig, 17 tab, 6 ref.

Descriptors: *Coal mine wastes, *Mine acids, *Waste water treatment, *Sampling, Evaluation, Treatment plants, Streams, Stream flow, Benthos, Aquatic plants, Water chemistry, Water analysis, Pollutant identification, Water quality, Pennsylvania.

Three mine drainage plants, Bercik, Kefovor and Thompson, operating at Jones and Laughlin Steel Corporation mines in Washington County, Pennsylvania, were selected for chemical and biological sampling. A fourth site, representing an untreated effluent discharged to a tributary and located on the Little Indian Creek north of Riversville, West Virginia, was selected as a control station. Chemical samples collected from four areas at each of the treatment plants included: the receiving stream above and below the tratment plant; the untreated mine discharge being pumped from the borehole; and the treated effluent before its discharge into the receiving stream. Similar samples were collected at the control site. Ten additional parameters were included for analysis along with those associated with mine drainage. Generally, the plants were effective in removing common mine drainage parameters, but two of these plants occasionally discharged final effluent containing excessive concentrations of acidity, suspended iron and total iron. The treated mine effluent below the three plants affected the benthos in the receiving streams. The most effective treatment plant, Kefover, has a larger receiving stream flow which dilutes the residual chemical constituents to a more tolerable level; the benthos in the receiving stream were only slightly affected. Thompson Plant, as effective as the Kefover Plant, occasionally discharged acid slugs, reducing its overall treatment capability. The benthos is severely depressed immediately below the Bercik Plant, the least efficient of those studied. The limited dilution capacity of the receiving stream impairs its operationa effectiveness. (Davison-IPA)
W79-02794

OWENS-CORNING FIBERGLASS CORPORATION WASTEWATER TREATMENT FACILITY, ANDERSON, SOUTH CAROLINA, TECHNICAL SUPPORT PROJECT MARCH-MAY 1973.
National Field Investigations Center-Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-231 123, Price codes: A05 in paper copy, A01 in microfiche. December 1973. 85 p, 30 fig, 11 tab, 7 append.

Descriptors: *Waste treatment, *Treatment facilities, *Effluent quality, *Industrial wastes, *Training, Samples, Chemical analysis, Sludge, Testing, Sampling, Aerobic digestion, Coagulation, Biological oxygen demand, Acidity, Solid wastes, Water pollution, Measuring instruments, Suspended solids, Owens-Corning Fiberglass Corporation, Anderson, South Carolina.

To improve performance of the Owens-Corning Fiberglass Facility, at anderson, South Carolina, operators were trained in the use of the National Field Investigation Center (NFIC) operational control procedures. They were taught how to calculate control adjustment demands from sludge quality and process status tests, and how to display essential test data and process relationships, which would allow analysis of process response to control adjustments. In completing the evaluation of plant loadings and process response to control adjustments many components were calculated, tabulated, and/or plotted. Operator skill was acquired during the project so that final effluent quality became consistent, and the plant was able to withstand 'shock loads.' The loadings and treatment accomplished during the final 77 days of the support project are tabulated. (Davison-IPA)
W79-02796

THE USE OF THE PROTOCOCCACEAE FOR PURIFYING WASTE WATER (PRIMENIYE PROTOKOKKOVYKH VODOROSLEY DKYA OCHISKI STOCHNYKH VOD),
V. N. Yuzvenko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 711-T, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-BTR-76-14, 1971. Sakhaarnaya Promyshylennost', Vol. 45, No. 11, pp 20-22, 1971. Translated by SCITRAN (Scientific Translation Service), Santa Barbara, CA. 6 p, 1 tab.

Descriptors: *Waste water treatment, *Algae, *Agricultural wastes, *Sugar beets, Water purification, *Protococcaceae chlorella, Cenedesmus, Lime, Neutralization, Filtration, Lagoons, Waste water, Coagulation, Sedimentation, Ukraine, USSR, Soil disposal fields, Soil properties.

A method for purifying sugar process waste water in filtration fields is described. The filtering capacity of the soil in filtration fields at sugar plants in the Ukraine, SSR is very poor, and the natural processes of autopurification occur very slowly or not at all. The natural processes are intensified somewhat through liming these waste waters, and it was found that these processes were further enhanced with the addition of mixtures of Protococcaceae chlorella and cenedesmus. Waste water is first limed to neutralize it because the oxidizing micro-organisms favor a neutral or slightly alkaline medium. Liming also facilitates coagulation of the colloid compounds in waste water, enhancing sedimentation of suspended particles. Liming is conducted during the production season and terminates at least three months before planting the algae in the waste water. Milk lime is used and introduced in an irrigation agitator with the water temperature at 5C. Algolization, seeding the waste water with mixture of Protococcaceae chlorella and cendesmus in paste or suspension, creates an algae concentration which will ensure a predominance of algae over the entire purification period. Algolization is conducted in two stages: (1) the algae are planted in a reservoir for primary algolization, and (2) when the waste water becomes an algae suspension, it is immediately dispersed into remaining reservoirs of waste water as stage two. Results of algolization of waste water in reservoirs of filtration fields at sugar plants in Vinitsa, Kiev, and Odessa are tabulated. (Davison-IPA)
W79-02797

EXPERIENCE WITH WASTE WATER ACID NEUTRALIZATION (ERFAHRUNGEN MIT ABWASSER-SAUREZNEUTRALISATION),
B. Kratz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 198, Price codes: A02 in paper copy, A01 in microfiche. Vom Wasser, No. 17, pp. 83-88. Dece 10, 1974, 12 p, 3 fig, 1 tab. Translated b Army Medical Intelligence and Information Agency, Washington, DC. Translation No. USAMIIA-K-5240.

Descriptors: *Waste water treatment, *Industrial wastes, *Acidic water, *Nitrogen compounds, *Neutralization, Sludge, Lime, Aeration, Explosives, Equipment, Filters, Toxic wastes, Water requirements, Water cooling, Water chemistry, Water analysis, Effluents, Germany.

The waste water treatment systems and processes of trinitrotoluene (TNT) plants built in Germany during the mid 1930s are examined. In producing 4,000 tons of TNT per month, 40,000 m3 per day of water were consumed; 5 to 6,000 m3 of this was acidic waste water contaminated with nitrogen compounds. There were three varieties of waste water: manufacturing was water; condensate from sulfuric acid concentration; and building cleaning waste water. The development of the waste treatment process from a clarification system to a formal treatment plant is discussed, and a schematic view of the neutralization plant is provided. (Davison-IPA)
W79-02798

OXIDATION OF PESTICIDES BY OZONE AND ULTRAVIOLET LIGHT,
Houston Research, Inc., TX.
C. E. Mauk, H. W. Prengle, Jr., and J. E. Payne.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 306, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. 7206, July 1976. 73 p, 13 fig, 46 tab, 6 ref. IT76270D048-07, DAAG53-76-C-0089.

Descriptors: *Waste treatment, *Waste water treatment, *Pesticide removal, *Toxic wastes, *Ozone, *Ultraviolet radiation, DDT, Pentachlorophenol, Vapam, Baygon, Models, Mathematical models, Gas chromatography, Water purification, Water quality control, Effluents, Potable water, Water pollution treatment.

An experimental study to determine the feasibility of the oxidative destruction in water of the five pesticides, malathion, Baygon, Vapam, pentachlorophenol, and DDT, by ozone with ultraviolet light is reported. The individual pesticides were treated by ozone with varying combinations of ultraviolet intensities and temperatures in a sparged stirred tank reactor. Gas chromatographic analysis indicated destruction of the pesticide and that the total organic content of the water, including contributions from the pesticide and intermediate oxidation products, was reduced to the limit of detectability. A mathematical model was developed, from which constants were calculated characterizing the reactions. The resulting data will permit the design of prototype treatment equipment for the removal of pesticides from effluents or potable water. (Davison-IPA)
W79-02799

PCBS WATER ELIMINATION/REDUCTION TECHNOLOGY AND ASSOCIATED COSTS, MANUFACTURERS OF ELECTRICAL CAPACITORS AND TRANSFORMERS,
Versar, Inc., Springfield, VA.
R. Durfee.
Available from the National Technical Information Service, Springfield, VA 22161, Price codes: A03 in paper copy, A01 in microfiche. Addendum to Final Report, Task II, Report No. EPA 440/9-76-020, July 2, 1976. 39 p, 2 fig, 9 tab, 8 ref. 68-01-3259.

Descriptors: *Waste pollution sources, *Industrial wastes, *Polychlorinated biphenyls, *Waste identification, Industrial plants, Cooling water, Water pollution, Water pollution control, Vacuum pumps, Waste water, Cost analysis, Estimated costs, Discharge(Water), Cost comparison, Waste water treatment.

The quantities and sources of the waste waters within the askarel capacitor and transformer manufacturing industry are summarized. Waste waters containing measurable quantities of PCBs are dis-

charged at seven point sources: (1) non-contact cooling water; (2) water-sealed vacuum pumps and steam-jet ejectors; (3) detergent washing of components and assemblies; (4) boiler blowdowns, air conditioning condensates, and contact cooling water; (5) contaminated process wastewaters; (6) sanitary and personal hygiene waste waters; and (7) the wet scrubber for the waste incinerator flue gas at one plant. Technologies for eliminating these discharges are described, and a method for estimating the costs of this elimination is presented. Estimated costs to achieve zero discharge on an industry wide basis extrapolated from survey data of eight plants are tabulated. The technologies and costs for eliminating PCB contamination of rainwater runoff from storage and material transfer areas of these plants are discussed. Three alternate approaches for the reduction of PCBs in the direct discharges of these plants and their estimated costs are presented. The selected approaches offer a range of PCB controls at various cost levels. (Davison-IPA)
W79-02800

CONTAINER CORPORATION OF AMERICA BREWTON MILL-CONECUH-ESCAMBIA RIVER BASIN STUDY II,
Environmental Protection Agency, Atlanta, GA. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-213 301, Price codes: A04 in paper copy, A01 in microfiche. Progress Report, November 1971. 52 p, 10 fig, 6 tab, 4 append.

Descriptors: *Industrial wastes, *Waste water treatment, *Water pollution abatement, *Water pollution sources, Bleaching wastes, Chemical wastes, Pulp wastes, Pulp and paper industry, Waste treatment, Effluents, Aeration, Oxidation, Water chemistry, Liquid wastes, Suspended solids, Organic wastes, Container corporation of America, Conecuh-Escambia River Basin, Alabama, Biochemical oxygen demand.

An evaluation of the waste treatment at Container Corporation of America's (CCA) Integrated Pulp and Paper Mill located at Brewton, Alabama, is reported. A previous report, 'Effect of Pollution on Water Quality. Escambia River and Bay, Florida' identified Brewton Mill as the major source point of carbonaceous wastes discharged into the Conecuh-Escambia River and recommended removal of 90% of the carbonaceous waste generated by this mill. The pollution abatement program initiated by CCA included the addition of a 22-acre aeration basin using ten-75 horsepower aerators. Existing operating treatment units included a clarifier, liquid oxygen application, oxidation pond, and ponding in six natural lakes. Unbleached pulp processing wastes amounting to 17.2 mgd is routed through the treatment units; bleachery waste and woodyard drainage of 17.3 mgd are treated only by the natural lakes. A comparison of study results of the August 1970 and June 1971 surveys is presented. Nine specific conclusions drawn from the present study indicate: that BOD5 reductions are in excess of the recommended 90%; secondary treatment and improved in-plant controls reduced the discharged effluent to less than half of the recommended 4,850 pounds per day limit; CCA has not complied with the recommendation of secondary treatment for bleach plant and woodyard wastes; all waste loadings were reduced; and measurements of water parameters indicated relatively good water quality in the Conecuh-Escambia River tributaries. Water quality data obtained during the June and July 1971 survey are tabulated. (Davison-IPA)
W79-02804

STUDY ON POWER-LAUNDRY WASTEWATER TREATMENT,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA. Sanitary Sciences Div.
D. S. Lent.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A008 332, Price codes: A05 in paper copy, A01 in microfiche. Final Technical Report No. 2118, November 1974. 89 p, 22 fig, 28 tab, 7 ref, 8 append. 1G763702DK39-31.

Descriptors: *Waste water treatment, *Laundering, *Water pollution abatement, *Water purification equipment, Water chemistry, Polyelectrolytes, Trace elements, Water quality, Biochemical oxygen demand, Activated carbon, Heavy metals, Laboratory tests, Polymer, Suspended solids, Effluents, Detergents, Cation adsorption, Sampling.

An evaluation of the effectiveness of a waste water treatment process utilizing powdered, activated carbon, a cationic polyelectrolyte, and a modified, standard military water-purification unit (ERD Lator) for the treatment of commercial-type (power) laundry waste waters is reported. Field tests were carried out at Sterling Laundry, Washington, D.C. The following laboratory analyses were performed: turbidity, hydrogen and ion concentration (pH), detergents, biochemical oxygen demand (BOD), conductivity, total organic carbon (TOC), suspended solids, hexane solubles, and heavy metals, including mercury, antimony, copper, lead, zinc, chromium, silver, iron and nickel. It is concluded that: (1) the carbon/polymer/ERD Lator process effectively restores power-laundry effluents to a suitable quality for reuse or discharge into navigable waters, complying with proposed Environmental Protection Agency effluent limitation guidelines; (2) the fluctuations in the chemical characteristics of these waste waters does not affect the quality of the restored water; and (3) pH or total dissolved solids are not significantly changed by the process. (Davison-IPA)
W79-02807

EFFECTS OF WASTEWATER PROCESS OPERATION ON ORGANICS IN POTABLE WATER SUPPLIES,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
C. Aemisegger, W. P. Bonner, R. B. Bustamante, and R. W. Lowhorn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 340, Price codes: A06 in paper copy, A01 in microfiche. Tennessee Water Resources Research Center University of Tennessee, Knoxville. Research Report No. 68, December, 1978. 109 p, 33 fig, 5 tab, 77 ref. OWRT A-048-TENN(1), 14-34-0001-8045.

Descriptors: *Rotating biological contractors, *Nitrification, Organic compounds, Water supply, Potable water, *Biological treatment, Films, *Chemical oxygen demand, Waste water treatment, *Refractory compounds, Treatment facilities, Performance.

The primary purpose was to ascertain whether the soluble chemical oxygen demand (COD) discharged from a typical film-type biological treatment plant is residual or refractory in orgin and the extent to which nitrification takes place. This research should also determine where and under what conditions transformations between residual and refractory compounds occur in biological film treatment units. The experimental work was conducted on a 16 stage laboratory scale rotating biological contactor typical of fixed film-type treatment processes. Feed consisted of a chemically defined source of carbon, glucose, plus essential nutrients and trace metals. Soluble COD, glucose, ammonia, nitrite, nitrate and specific low molecular weight voltile organics were determined as a function of treatment stage, pH, and rotational speed. The soluble organics in the effluent of the laboratory scale treatment unit were refractory and consisted of detectable quantities of acetic and propionic acids and other organics exhibiting a COD. Under normal operating conditions the soluble COD varied inversely with contact time and rotational speed. COD removals of between 85 and 93% were obtained. Under adverse pH conditions typical of treatment plant malfunction or misoperation, ie. low pH, the soluble COD through the treatment plant decreased to a minimum between stages 6 and 10 and then increased through stage 16. Nitrification was suppressed at higher rotational speeds and with an increase in the ionic strength of the solution
W79-02815

MICROBIOLOGICAL CONSIDERATIONS OF OZONE TREATMENT OF REUSE WATER IN FISH HATCHERIES,
Idaho Univ., Moscow.
P. J. Colberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 342, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, August 1977. 65 p, 15 fig, 26 ref. OWRT A-053-IDA(1), 14-34-0001-7027/7028.

Descriptors: Fish, Fish hatcheries, *Fish diseases, Fish populations, *Ozone, Carbon, Ammonia, Nitrites, Water chemistry, Nitrification, Disinfection, *Ozonation, Water reuse, *Fish pathogens, Bacteria, Waste water treatment, Micorbiology, Oxidation.

The effectiveness of ozone as an alternative to current ultraviolet disinfection of makeup water and its potential for treatment of recycled water in commercial reuse hatcheries was considered. Comparative survival rates in water were established for four bacterial fish pathogens (Aeromonas salmonicida, Aeromonas liquefaciens, Pseudomonas fluorescens, and the causative agent of Hagerman Redmouth Disease) and spores of BAcillus polymyxa during batch and continuous flow ozonation in the laboratory. Greater than 99% mortality of the fish pathogens was observed within 60 seconds contact during continuous flow exposure at all concentrations of ozone applied. Spores of B. polymyxa were resistant at a residual concentration of 1.0 mg/l. The oxidation of the combined bacterial-protozoan biomass closely approximated oxidation rates established for the pure culture studies with no significant difference in relative survival rates between bacteria and protozoa. Increased ozone concentrations caused increased mortaity rates, while elevated carbon levels did not appear to exert a preferential ozone demand when added to suspensions of test organisms. Results of the survival studies refute 'all-or-none' phenomenon reportedly associated with ozone treatment. (Trihey-Idaho)
W79-02823

ANAEROBIC DIGESTION AND REVERSE OSMOSIS SEPARATION FOR THE TREATMENT OF DOMESTIC LIQUID WASTE,
Thayer School of Engineering, Hanover, NH.
J. M. S. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 329, Price codes: A09 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 170 p, 26 fig, 17 tab, 61 ref. OWRT A-034-NH(1), 14-31-0001-5029.

Descriptors: Sewage effluents, Sanitary engineering, *Semipermeable membranes, *Reverse osmosis, *Anaerobic digestion, Domestic wastes, Membranes, Membrane processes, *Waste water treatment, *Digesters, Environment, Pollution.

A new system employing a semipermeable membrane to process home sewage is proposed. The waste water from the home is treated in a three stage tank which acts as an anaerobic digestor and a settling chamber. The effluent is then pumped under pressure to a unit containing a semipermeable membrane. The nutrients and the microorganisms are retained by the membrane and returned to the digester. The product of the membrane unit can be disposed into the environment without further treatment. The research indicates that (1) the digester will operate properly at the higher organic and mineral load which results from operation in conjunction with the membrane unit, (2) the effluent of the system may be disposed into the environment without fear of pollution, (3) cyclic operation consisting of short pressurized and depressurized periods will reduce concentration polarization at low bulk flow velocities, (4) the cellulose acetate membrane will maintain its integrity for at least a year while processing septic effluent. Full scale

prototype testing is the recommended action for further development.
W79-02826

DESALINATION TECHNOLOGY TRANSFER CENTER,
Fairleigh Dickinson Univ., Teaneck, NJ. Coll. of Science and Engineering.
For primary bibliographic entry see Field 3A.
W79-02840

COAGULATION OF MONODISPERSE COLLODAL PARTICLES IN LOCALLY ISOTROPIC TURBULENT FLOWS,
Massachusetts Inst. of Tech., Cambjridge. Dept. of Mechanical Engineering.
R. F. Probstein, and M. A. Delichatsios.
Available from the Natinal TEchnical Information Service, Springfield, VA 22161 as AD-A041 479, Price codes: A02 in paper copy, A01 in microfiche. Omaggio A Carlo Ferrari, Torino (Italy), p 635-642, December 1974. 2 fig, 6 ref. ONR-N00014-67-A-0204-0057.

Descriptors: *Coagulation, *Colloids, *Waste water treatment, *Model studies, Mathematical models, Laboratoryf tests, Flow, Turbulent flow, Particle size, Pipe flow, Colloidal particles, Destabilization.

This study was an attempt to obtain a better understanding of how dispersed colloidal particles coagulate into larger size flocs under the action of a turbulent flow field. It was anticipated that the information developed on the physiochemical hydrodynamics of this process would lead to the more efficient design of wastewater treatment systems where coagulation of colloidal particles is normally a prerequisite to filtration, sedimentation, or flotation. (Sims-ISWS)
W79-02873

FEASIBILITY OF REMOVING PHENOLS FROM SURFACE WATERS BY CARBON ADSORPTION,
Louisville Univ., KY. Dept. of Civil and Environmental Engineering.
J. S. Zogorski, and S. D. Faust.
In: Proceedings, Second World Congress, International Water Resources Association, New Delhi, India, December 1975, Vol. II, p 89-97. OWRT A-033-NJ(3), 14-31-0001-4030.

Descriptors: Water quality, *Water quality control, *Waste water treatment, *Phenols, *Activated carbon, Odor, Taste, Water treatment, Adsorption, Carbon adsorption.

Historically, the design of granular activated carbon has been concerned primarily with hydraulic consideration. Presently, individuals who are designing activated carbon systems are becoming more aware of the necessity of evaluating the chemical and physical aspects inherent in the adsorption process. Adsorption is a physiochemical process. Consequently, the design and operation of activated carbon units cannot be optimized unless the physical and chemical aspects of the adsorption process are also considered. Physical and chemical parameters associated with the adsorbate, adsorbent and experimental system were evaluated for their influence on the adsorption of phenols with activated carbon. Characteristics evaluated included temperature, solubility of adsorbate, type of adsorbate, concentration of adsorbate, extent of protolysis, carbon particle size, depth of adsorbent and linear velocity. A qualitative summary of these physiochemical parameters on the operation efficiency of a fixed-bed carbon was developed. In addition, the overall feasibility of removing phenols from aqueous solution by carbon adsorption is presented.
W79-02880

AEROBIC DIGESTION OF WASTEWATER SLUDGE UNDER LOW TEMPERATURE CONDITIONS,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
P. L. Bishop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 519, Price codes: A06 in paper copy, A01 in microfiche. Water Resource Center, Univ., of New Hampshire Research Report No. 18, 1978. 115 p, 23 fig, 12 tab, 64 ref. OWRT A-037-NH(3), 14-31-0001-4029.

Descriptors: *Waste water treatment, *Aerobic digestion, *Aerobic treatment, *Sludge digestion, *Temperature, Activated sludge, Mixing, Phosphorus, Digestion, Nutrients, Sludge, Sludge treatment, Filtration, Sewage treatment, Digestion, Batch reactors, Continuous flow reactors, Settleability, Filterability, Volatile solids, Oxygen uptake, Primary sludge, Secondary sludge, Nutrient transformations.

The main purposes were to investigate the effect of cold temperatures (5 to 30C) on the aerobic digestion process, and the fate of nutrients (nitrogen and phosphorus) in the sludge during digestion. Studies were performed using primary sludge from two locations and waste activated sludge from two others; both batch and continuous flow reactors were used. The effect of temperature on digestion operation and digestion kinetics was determined by operating digesters at varying temperatures, detention times and loading rates, and analyzing for both solids and organic destruction. Changes in settleability and filterability of the sludge were also measured. Nutrient transformations during digestion were determined by maintaining a nutrient mass balance during the aerobic digestion process.
W79-02911

PCBS INVOLVEMENT IN THE PULP AND PAPER INDUSTRY,
For primary bibliographic entry see Field 5B.
W79-02920

WASTEWATER DISINFECTION IN CANADA,
Canadian Environmental Protection Service, Economic and Technical Review, Report No. EPS 3-WP-78-4, 99 p, May, 1978. 172 ref, 7 tab, 3 append.

Descriptors: *Waste water(Pollution), *Disinfection, *Canada, Effluents, Wastes, Waste treatment, North America, Foreign countries, United States, Europe, Chlorination, Water purification, Water quality control, Diseases, Chlorine, Byproducts, Microorganisms, Costs, Environmental effects, Aquatic microorganisms, Aquatic life, Water treatment, Public health, Human pathology.

This report summarizes existing waste water disinfection requirements throughout Canada, and in the U.S.A. and Europe. The effectiveness of chlorination in combatting the spread of waterborne disease is assessed, and the possible effects of residual chlorine and chlorination by-products on man and aquatic species are discussed. Disinfection alternatives are reviewed with respect to their effectiveness in reducing pathogens, availability, relative costs, environmental impact, and other practical considerations. The protection of both public health and the environment must be taken into account when formulating policies and criteria for waste water disinfection. (Witt-IPC)
W79-02935

PAPER PULP COMPOUNDS CONTAINING ACTIVE SLUDGE,
Soviet Patent SU 440468. Issued January 31, 1975. Soviet Inventions Illustrated, Vol. W, No. 27, p F1-F2, August 12, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Patents, *Activated sludge, Recycling, Sludge disposal, Economics, *Pulp wastes, Cardboard, Punch resistances, Ring compression values.

A process for using the waste activated sludge from pulp and paper processing effluent treatment plants in packaging materials manufacturing has been patented. Activated sludge from a plant for the biological purification of waste water from a paper and pulp factory is added to paper pulp (for economy and improved strength) in the following proportions: fibrous components, 8-95 percent; and, activated sluge, 5-20 percent. The sludge is added to the ground and sized fibrous mass as it is passed to the mixer pump, before pouring. Unbleached sulfate celluose 24 degrees Schopper-Riegler was sized with rosin precipitated with clay. Prior to pouring, activated sludge suspension with a concentration of about 20 g/liter was added to the cellulose pulp (to the extent of 5 percent of the dry fiber weight). Cardboards weighing 200 g/sq m and 260 g/sq m were poured. The respective punch resistances were 8.1 and 9.95 kg/sq cm, and the respective ring compression values were 2.51 and 3.38 kg. Without the addition of activated sludge, the respective punch resistances were 6.9 and 9.2 kg/sq cm, and the respective ring compression values were 6.9 and 3.4 kg. (Orr-FIRL)
W79-02941

ADSORBENT FOR INDUSTRIAL EFFLUENTS PREFERABLY CONTAINING DYES,
Belgian Patent BE-821-941. Issued May 7, 1975. Derwent Belgian Patents Report, Vol. W, No. 21, p D1, July 1, 1975.

Descriptors: *Waste water treatment, *Patents, *Industrial wastes, Tanneries, Textiles, Pulp and paper industry, Dyes, Adsorption, Activated carbon, Chemical precipitation, Polymers.

An adsorbent has been patented for the treatment of aqueous industrial wastes particularly from the treatment baths in the textile, paper, or leather industries or from dye or optical whitener manufacturing. The adsorbent contains a support pretreated with precipitating agents and activated carbon. The supports are synthetic plastics, mineral fillers such as cellulosic materials and mixtures of these. The precipitating agent is preferably a basic nitrogen polymer, such as a polyamide-polyamine from a fatty acid polymer and a polyamine, an aminoplast, or a polyalkyleneimine. The precipitating agent may be associated with a polyanionic polymer, prticularly an alpha, beta-ethylenic unsaturated acid, or a polyvalent metal salt or both. The treatment is performed at 10 to 150 C, but preferably between 30-100 C, with the adsorbent in the form of a filter. Adsorbents may also contain from 2 to 95 percent activated carbon, especially 10-70 percent carbon. The mixture of the adsorbents has a greater adsorbing power than carbon alone and is an efficient and economical water treatment process for the above type of effluents. (Orr-FIRL)
W79-02943

COLOUR AND TOXICITY REMOVAL FROM BLEACH PLANT EFFLUENTS USING A HIGGINS CONTACTOR,
Atlantic Analytical Services Ltd., St. John (New Brunswick).
W. J. Wilson, J. T. Wearing, and S. M. Miller.
Canadian Environmental Protection Service, Ottawa, Ontario K1A 1C8, Cooperative Pollution Abatement Research (CPAR) Project Report 544-1, March, 1977. 47 p. 5 fig, 17 ref, 16 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Decoloring, *Detoxification, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Color, Toxicity, Pulp wastes, Pulp and paper industry, Adsorption, Biochemical oxygen demand, Fish, Flow rates, Hydrogen ion concentration, Solids contact processes, White liquor(Kraft process), Kraft mills.

Adsorption of bleached kraft mill effluents (chlorination-stage and alkaline extraction waste liquors) on Amberlite XAD-8 achieved color removals of 70 to 85% in addition to BOD reductions and excellent toxicity removal, the treated effluents being nontoxic to fish at 100% concentration. The adsorbent's efficiency depended on flow rate, being better at low flow rates. The alkaline extraction effluent had to be adjusted to pH 2.5 (similar to that of the chlorination-stage effluent) before adsorption became effective. Of two regenerant

streams tested, white liquor was effective, but chlorine dioxide generated effluent was not. Present operating data indicate that the use of a Higgins continuous countercurrent contactor offers no significant advantage over a fixed-bed system. (Brown-IPC)
W79-02953

5E. Ultimate Disposal Of Wastes

EVALUATION OF THE MC-300A SOIL MOISTURE METER TO DETERMINE IN-PLACE MOISTURE CONTENT OF REFUSE AT LAND DISPOSAL SITES,
Environmental Protection Agency, Cincinnati, OH. Solid Waste Management Office.
For primary bibliographic entry see Field 5A.
W79-02503

THE U-TUBE FOR WATER AERATION,
Rocketdyne, Canoga Park, CA.
For primary bibliographic entry see Field 5D.
W79-02506

THE CONTAMINATION OF GROUNDWATER BY HEAVY METALS FROM THE LAND DISPOSAL OF FLY ASH,
Notre Dame Univ., IN. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-02507

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES, UNITED STATES STEEL CORPORATION, IRVIN PLANT, PITTSBURGH, PENNSYLVANIA, AUGUST 18-28, 1975.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5B.
W79-02515

FEASIBILITY OF THE FUNCTIONAL USE OF VEGETATION TO FILTER, DEWATER AND REMOVE CONTAMINANT FROM DREDGED MATERIALS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
C. R. Lee, R. E. Hoeppel, P. G. Hunt, and C. A. Carlson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 336 Price codes: A05 in paper copy, A01 in microfiche. Final Report No. WES-TR-D-76-4, June 1976. 86 p, 12 fig, 9 tab, 137 ref, 5 append.

Descriptors: *Vegetation, *Vegetation establishments, *Waste dumps, *Waste treatment, Spoil banks, Contaminants, Slurries, Filtering, Dredging material, Heavy metals, Lead, Mercury, Zinc, Nitrogen, Phosphorus, Cadmium, Feasibility, Literature, Water quality, Environmental effects.

Information compiled from a literature review and field observations was examined to determine the feasibility of using vegetation to filter, dewater and remove contaminants from dredged material slurry and effluent from confined disposal areas. Dredged material and potential vegetative colonizers from freshwater, brackish, and saline environments were considered in six U.S. geographical areas. Natural vegetation inside the disposal sites and the surrounding vacinities were identified, and a summary was compiled to provide a listing of plants for potential propagation on disposal sites. Conclusions resulting from the study include: the quality of discharge water from contaminated areas would be improved by the physical and chemical interactions of the vegetation with the dredged slurry; significant amounts of nitrogen and phosphorus could be removed from discharge waters by utilizing selected vegetation; feasibility is limited in the use of selected vegetation to remove heavy metal pollutants from dredged material; use of vegetation should be restricted if dredged sedi contain high levels of mercury, lead, or cadmium, as contamination by these elements precludes the use of the area as wildlife habitats; use of vegetation to dewater and consolidate fine textured dredged material is feasible; native plant species should be used if possible; the practicality of establishing and using vegetation will depend on the projected use of the area or the dredged material contaned therein. It is recommended that natural vegetation within a site be left intact, and the potential for contamination of the food chain by concentrations of the contaminants be evaluated. (Davison-IPA)
W79-02517

AN ASSESSMENT OF THE OCCURRENCE OF HUMAN VIRUSES IN LONG ISLAND AQUATIC SYSTEMS,
Brookhaven National Lab., Upton, NY.
For primary bibliographic entry see Field 5C.
W79-02584

CONSEQUENCES OF LEACHING FROM PULP AND PAPER MILL LANDFILL OPERATIONS.
Econotech Services Ltd., New Westminster (British Columbia).
For primary bibliographic entry see Field 5B.
W79-02591

A FIELD STUDY OF TREATMENT VS. DEPTH OF SAND FILL IN A MOUND SYSTEM,
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5D.
W79-02604

BASELINE REPORT OF ENVIRONMENTAL CONDITIONS IN DEEPWATER DUMPSITE 106. VOL I: PHYSICAL CHARACTERISTICS.
National Ocean Survey, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 578, Price codes: A11 in paper copy, A01 in microfiche. NOAA Dumpsite Evaluation Report 77-1, June 1977. 232 p.

Descriptors: *Continental shelf, *Waste disposal, *Industrial wastes, *Environmental effects, Baseline studies, Climate, Delaware, New York, Water quality control, *Outer Continental Shelf, *Ocean dumping, New York Bight, Physical oceanography.

The results of field studies conducted by NOAA in and about the Deepwater Dumpsite 106 (DWD-106), approximately 106 nautical miles from Ambrose Lightship and 90 nautical miles due east of Cape Henlopen, Delaware, are given in this baseline report, for the purpose of characterizing the site's environment and biota. The Baseline Report is divided into three sections: Physical Characteristics which appear as volume 1, Biological Characteristics, volume 2, and Contaminant Inputs and Chemical Characteristics, volume 3. An Appendix, containing results too detailed for the main body of the report is included in volume 3. Characterization results are chiefly from three baseline cruises, but also from data obtained during two summer 1976 experimental cruises, as well as from National Marine Fisheries Service sources. This volume contains the following studies: Deepwater Dumpsite 106, bathymetry and bottom morphology; Six dives to the lower continental slope and upper continental rise southwest of Hudson Canyon - geological aspects; General physical oceanography of Deepwater Dumpsite 106; Physical Oceanography of Deep Deepwater Dumpsite 106, update - July 1975; Physical oceanography of Deepwater Dumpsite, February - March 1976; and Climatic study of New York Bight. (See also W79-02623) (Sinha-OEIS)
W79-02622

BASELINE REPORT OF ENVIRONMENTAL CONDITIONS IN DEEPWATER DUMPSITE 106. VOLUME II: BIOLOGICAL CHARACTERISTICS.
National Ocean Survey, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 579, Price codes: A12 in paper copy, A01 in microfiche. NOAA Dumpsite Evaluation Report 77-1, June 1977. 271 p.

Descriptors: *Continental Shelf, *Waste disposal, *Industrial wastes, *Environmental effects, Baseline studies, Aquatic animals, Aquatic plants, Ecology, Water quality control, New York, Delaware, *Outer Continental Shelf, *Ocean dumping, New York Bight, Biological oceanography.

Biological data obtained on the baseline cruises provided limited quantitative coverage of the region. Together with other available data, this also sufficed to provide a qualitative biological overview of the region. A complete picture is not yet available and distinguishing dumping effects from natural variations will continue to be a problem. This volume contains the following studies: Phytoplankton in the vicinity of Deepwater Dumpsite 106; Deepwater Dumpsite 106 - Zooplankton studies; Gelatinous zooplankton at Deepwater Dumpsite 106; Apex predators in DWD 106; Distribution and abundance of mesopelagic fishes on cruises 2 and 3 at DWD 106; Observations from DSRV ALVIN on populations of benthic fishes and selected larger invertebrates in and near DWD-106; Epibenthic invertebrates; Epifaunal megabenthos in DWD 106; Final report on benthic infauna of DWD 106 and adjacent areas; and Neuston fish at DWD-106. (See also W79-02622)(Sinha-OEIS)
W79-02623

NUTRIENTS, TOXINS, AND WATER IN TERRESTRIAL AND AQUATIC ECOSYSTEMS TREATED WITH SEWAGE PLANT EFFLUENTS - FINAL REPORT OF THE UPLAND RECHARGE PROGRAM,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5D.
W79-02638

A HIGH-EFFICIENCY THERMAL DRYING SYSTEM,
V. Maffet.
In: Proceedings of the First International Symposium on Drying, August 3-5, 1978, McGill University, Montreal, Canada, Science Press, Princeton, p 147-151. 2 fig.

Descriptors: *Sludge treatment, *Dewatering, *Drying, *Dryers, Wastes, Sludge, Air pollution control, Venturi scrubbers, Electrostatic precipitators, Turbulent-Contact absorbers, Solid wastes, Water pollution sources.

The system described is a toroidal dryer suitable for the dewatering of effluent sludges and similar waste materials, and also of heat-sensitive goods, with minimum damage. Air-pollution control equipment for installation on such a drying system is also discussed, including venturi scrubber, electrostatic precipitator, and turbulent-contact absorber. (Brown-IPC)
W79-02675

POLYMER COAGULATION OF HUMIC ACID WATERS,
Clarkson Coll. of Technology, Potsdam, NY Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W79-02715

A FRESH WATER WASTE RECYCLING-AQUACULTURE SYSTEM,
Harbor Branch Foundation, Inc., Fort Pierce, FL
For primary bibliographic entry see Field 5D
W79-02759

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS, DOCUMENT NO. 3.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs
Available from the National Technical Information

Service, Springfield, VA 22161 as PB-261 156, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA/530/SW-151.3, June 1976. 20 p, 5 ref.

Descriptors: Publications, *Environmental effects, *Public health, *Waste disposal, Contaminants, Aquifers, Landfills, Cattle, Petrochemicals, Pollutant identification, Poisons, Industrial wastes, Sodium compounds, Soil contamination, Water pollution, Air pollution, Economics, Legal aspects, Solid Wastes Disposal Act, New Jersey, Louisiana, Maryland, Water pollution effects.

Three incidents of improper land disposal of hazardous wastes are documented as part of an investigation to determine the impact of such practices on public health and on the environment. The incidents reported are : (1) petrochemical contamination of the Cohansey Aquifer in New Jersey caused by the dumping of drums of liquid chemical wastes between August and September 1971; (2) hexachlorobenzene contamination of cattle in Louisiana discovered in December 1972; and (3) poison fumes resulting from a chemical reaction of industrial waste pollution at a Maryland landfill, causing six men to be hospitalized. (Davison-IPA)
W79-02792

DISPOSAL OF DILUTE PESTICIDE SOLUTIONS,
Environmental Protection Agency, Cincinnati, OH. Office of Solid Waste Management.
H. R. Day.
Available from the National Technical Service, Springfield, VA 22161 as PB-261 160, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA/530/SW-519, June 1976. 22 p, 1 tab, 18 ref.

Descriptors: *Pesticide disposal, *Waste disposal, *Ultimate disposal, Dilution, Waste treatment, Waste dumps, Waste storage, Lagooning, Incineration, Biodegradation, Chemical degradation, Filtration, Photodecomposition, Soil disposal fields, Soil bacteria, Regulations, Costs.

A compilation of current information on the disposal of excess dilute pesticide solutions is presented. These solutions include unused spray, container rinsate, equipment washings, and spill clean-ups which are equal to or less than the recommended application concentration. Current disposal practices include: use as a dilutant for spray mixtures; holding tanks, disposal pits, and dry wells; soil injection; chemical detoxification; incineration; photodecomposition; batch biodegredation; and special land disposal sites designed to avoid groundwater contamination. It is believed that use as a dilutent for spray mixtures is the most reliable and desirable disposal method, but the choice of method depends on the nature of the pesticide, its concentration, local disposal costs, and destruction assurance. A summary of the Federal regulatory efforts regarding pesticide disposal, and current research on disposal methods is given. (Davison-IPA)
W79-02795

OXIDATION OF PESTICIDES BY OZONE AND ULTRAVIOLET LIGHT,
Houston Research, Inc., TX.
For primary bibliographic entry see Field 5D.
W79-02799

HANDBOOK FOR PESTICIDE DISPOSAL BY COMMON CHEMICAL METHODS,
TRW Systems, Inc., Redondo Beach, CA.
C. C. Shih, and D. F. Dal Porto.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 864, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA/530/SW-112C, December 1975. 103 p, 18 tab, 91 ref, 4 append. 68-01-2956.

Descriptors: *Pesticide disposal, *Chemical degradation, *Landfills, *Decontamination solution, Alkali treatment, Personal protection, Disposal methods, Phosphorus compounds, Nitrogen compounds, Chlorine compounds, Diazinon, Toxicity, Pesticides, Water pollution, Neutralization.

An in-depth investigation of twenty key pesticides, representative of the major pesticide classes, was conducted to develop procedures advising pesticide users of safe, readily available chemical methods for pesticide disposal. Selection, based on production volume and toxicity, included the suitability of a pesticide's chemical structure in representing the chemical class, persistence in the soil, mobility and solubility in water. A literature review and information provided by pesticide manufacturers determined that alkali treatment is an effective environmentally safe method for disposal of naled, diazinon, Guthion, malathion, carbaryl, captan, and atrazine. No practical chemical degradation/detoxification methods were indicated for disposal of Dursban, methyl parathion, maneb, alachlor (Lasso), diuron, picloram, trifluralin, methoxychlor, chlordane, toxaphene, 2,4-D, amiben (chloramben), and pentachlorophenol. The recommended procedure for pesticide disposal is discussed in terms of personal protection, chemical detoxification by alkali treatment, pesticide container decontamination procedure, and alternate methods for disposing of small quantities of selected pesticides. An extensive list of references is included. (Davison-IPA)
W79-02806

WASTE DISPOSAL STUDY, EVALUATION OF METHODS TO RECOVER REUSABLE CHEMICALS FROM EVAPORATED PHOTOWASTES,
Computerized Pollution Abatement Corp., Leicester, NY. Pollution Abatement Div.
G. A. Lorenzo, and T. N. Hendrickson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 767, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. AFAL-TR-76-75, September 1976. 60 p, 10 fig, 12 tab, 6 append. F33615-74-C-1091.

Descriptors: *Photography wastes, *Waste water treatment, *Recycling, *Chemical wastes, Waste reclamation, Sodium compounds, Sulfur compounds, Sulfite liquors, Sewage treatment, Industrial wastes, Evaporation, Sulfonates.

The feasibility of recovering certain chemicals for reuse from evaporated photoprocessed wastes was investigated. Priority consideration was given to the reclamation of all or part of the chemical waste rendering it suitable for use by a part of the industry able to absorb all of these chemicals. Other factors included the conversion of all or a portion of the wastes into: (1) insoluble materials of construction; (2) harmless gases for release into the atmosphere; and/or (3) a form acceptable to conventional sewage treatment plants. It is concluded that sodium thiosulfate and sodium sulfite can be reclaimed for evaporated photographic wastes, with a recovery of 35% to 90% for sodium thiosulfate and 10% to 60% for sodium sulfite. Recovery of the developers, such as hydroquinone and elon, is economically impractical because they are present in low concentrations. Converson of sulfonated developers to recyclable quinone can be accomplished in low yields. Acetic acid or sodium acetate can be reclaimed by conversion to butyl acetate followed by distillation. Baron, phosphorus, silver, iron, and cadmium, present in small amounts, are not practical to recover. The reclamation procedure for thiosulfate and sulfite is cost effective. Best recovery efficiencies are realized when sodium thiosulfate concentrations is more than 50% of the total waste. (Davison-IPA)
W79-02809

RESIDUAL MANAGEMENT BY LAND DISPOSAL, PROCEEDINGS OF THE HAZARDOUS WASTE RESEARCH SYMPOSIUM.
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 768, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA-600/9-76-015, July 1976. Symposium held at Arizona Univ. Tuscon, Arizona, Febr. 2-4, 1976. 281 p, 135 fig, 79 tab, 194 ref. 804330.

Descriptors: *Hazardous wastes, *Conferences, *Solid wastes, *Waste disposal, Landfills, Municipal wastes, Industrial wastes, Hazards, Sampling, Pollution abatement, Chemical wastes, Oil spills, Pollutant identification, Environmental effects, Linings, Trace elements, Pollutant migration, Heavy metals, Pesticides, Leachates.

A compilation of papers on land disposal of municipal and hazardous wastes is presented. The papers are grouped according to the following subject areas: identification of pollution potential, modification of disposal sites and waste streams, special disposal problems, and predicting trace element migration. Major topics include: case studies of actual and potential environmental impact from land disposal of hazardous wastes; technology of preventing adverse environmental impact; selection of disposal sites to reduce adverse impact; identification of the potential pollution within selected industrial solid wastes; and special disposal problems. (Davison-IPA)
W79-02810

SOIL MORPHOLOGIC AND HYDRAULIC CHANGES ASSOCIATED WITH WASTEWATER IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W79-02817

THE ACCUMULATION, TRANSLOCATION AND DEGRADATION OF BIOCIDES AT LAND WASTEWATER DISPOSAL SITES: THE FATE OF MALATHION, CARBARYL, DIAZINON, AND 2,4-D BUTOXYETHYL ESTER,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5B.
W79-02890

CHEMICAL SEWAGE SLUDGE DISPOSAL ON LAND (LYSIMETER STUDIES) VOLUME II,
Department of Fisheries and Environment, Ottawa (Ontario). Wastewater Technology Centre; and Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
D. B. Cohen, and D. N. Bryant.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 79, 128 p, 43 fig, 53 ref, 35 tab. 72-3-6.

Descriptors: *Sewage sludge, *Chemicals, *Sewage disposal, *Lysimeters, Model studies, Leachate, Leaching, Heavy metals, Crops, Nutrient analysis, Sludge digestion, Iron, Lime, Canada, *Alum, *Ontario sludge disposal survey(1975), University of Guelph.

Lysimeter experiments in which crops were grown on agricultural soils treated with anaerobically digested sewage sludges (from plants where phosphorus removal was being practiced using metal salts) were initiated in 1972 and 1973. Alum, iron and lime treated fluid sludges were added to loamy sand and silt loam soils vegetated with orchard grass. Similarly, alum, iron and lime treated air-dried sludges were added to sand and clay soils and wheat crops were grown. The high application rates of fluid and air-dried sludges ranged from 32 to 76 and 47 to 144 tons dry wt per ha per yr, respectively. The metal loadings approximated the recommended maxima for Ontario agricultural land. The lower rates were one-third and two-thirds of the high rates. The results of these experiments are presented and compared to results from field and greenhouse studies. (WATDOC)
W79-02924

SUBLETHAL EFFECTS OF TREATED LIQUID EFFLUENT FROM A PETROLEUM REFINERY ON FRESHWATER ORGANISMS,
Sprague (J. B.) Associates Ltd., Guelph (Ontario).
For primary bibliographic entry see Field 5C.

W79-02929

PAPER PULP COMPOUNDS CONTAINING ACTIVE SLUDGE,
For primary bibliographic entry see Field 5D.
W79-02941

REEDS CONTROL EUTROPHICATION OF BALATON LAKE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5G.
W79-02954

5F. Water Treatment and Quality Alteration

EVALUATION OF THE WYOMING WATER SUPPLY PROGRAM.
Environmental Protection Agency, Denver, CO. Air and Water Programs Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 579, Price codes: A11 in paper copy, A01 in microfiche. December 1972. 250 p, 9 fig, 12 tab, 10 ref, 13 append.

Descriptors: *Water quality control, *Wyoming, *Water quality evaluation, *Water supply, Potable water, Chemical analysis, Public health, Water pollution treatment, Chlorination, Legislation, Bacteria, Aquatic bacteria, Manpower, Budgeting, Surveys, Chemical properties, Manpower, Budgeting

Results of in-depth studies of 23 public, 13 semi-public, and 127 individual supplies in Campbell, Lincoln, and Natrona Counties, Wyoming, are presented. Of the 23 public water supplies studied: 9% failed to meet manditory chemical drinking water limits; 35% failed to meet recommended chemical drinking water standards; 70% needed additional treatment facilities; 96% were not providing adequate disinfection (chlorination); and 96% had operators with little or no training in water treatment or systems. Semi-public and individual water supplies showed similar results. The adequacy of Wyoming's Water Supply Program was evaluated on the basis of surveillance activities, laboratory resources, policies, legislation, budget, and manpower. Indications are that funds and man-years available are inadequate to support the program effectively. Ten specific recommendations needed for Wyoming to have an effective and responsive Water Supply Program are presented. (Gibson-IPA)
W79-02512

INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).
American Management Systems, Inc., Arlington, VA
For primary bibliographic entry see Field 5G.
W79-02520

SOME IMPACTS OF SAFE DRINKING WATER STANDARDS ON RURAL WATER SYSTEMS,
Mississippi State Univ., Mississippi State. Div. of Business Research.
For primary bibliographic entry see Field 5G.
W79-02522

REPLACEMENT OF METALLIC IMPURITIES FROM WATER BY METAL BEDS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5F.
W79-02603

REPLACEMENT OF METALLIC IMPURITIES FROM WATER BY METAL BEDS,
Connecticut Univ., Storrs.
S. G. W. Munro
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 390, Price codes: A03 in paper copy, A01 in microfiche. M.S. Thesis, 1978. 22 p, 2 tab, 5 fig, 7 ref. OWRT A-063-CONN(1), 14-31-0001-5007.

Descriptors: *Electrochemistry, *Heavy metals, *Water purification, *Corrosion control, Aluminum, Zinc, *Removal efficiency, *Metallic impurities, Deposition products, Fluidization, Economic viability, Magnesium bed.

The use of metallic replacement reactions for noble metallic ion control was shown to be a realistic prospect. Static granular zinc beds were ideally efficient in removing the noble metal ions Hg (+2), Cu (+2), Pb (+2) which are a major source of corrosion in aluminum flow systems. Magnesium beds were effective in replacing the less noble ions Co (+2), Cd (+2), Cr (+2), Ni (+2). They also, however, suffer rapid corrosion limiting their economic viability. Aluminum was found to be essentially inert. Since aluminum and zinc form more protective coatings, it may be found that an Mg-Zn or Mg-Al alloy will corrode less rapidly while still being reactive to less noble ions. The effects of time on the process efficiencies were found to reflect the changing physical characteristics of static beds. Evidence suggested blockage of the bed by the deposition products effectively reduced the apparent size of the bed. Fluidization of the active metal dramatically improved the time characteristics of the removal efficiency while still maintaining a high electrochemical efficiency. (deLare-Conn)
W79-02603

CHEMICAL TREATMENT FOR ORGANIC COLOR REMOVAL FROM GROUNDWATERS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering
For primary bibliographic entry see Field 5D.
W79-02782

TECHNICAL GUIDELINES FOR PUBLIC WATER SYSTEMS.
Clean Water Consultants, El Dorado Hills, CA
For primary bibliographic entry see Field 5G.
W79-02787

EFFECTS OF WASTEWATER PROCESS OPERATION ON ORGANICS IN POTABLE WATER SUPPLIES,
Tennessee Technological Univ., Cookeville. Dept of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-02815

FEASIBILITY OF REMOVING PHENOLS FROM SURFACE WATERS BY CARBON ADSORPTION,
Louisville Univ., KY. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W79-02880

WASTEWATER DISINFECTION IN CANADA,
For primary bibliographic entry see Field 5D.
W79-02935

5G. Water Quality Control

EVALUATION OF MEASURES FOR CONTROLLING SEDIMENT AND NUTRIENT LOSSES FROM IRRIGATED AREAS,
Idaho Agricultural Experiment Station, Moscow
D. W. Fitzsimmons, C. E. Brockway, J. R. Busch, L. R. Conklin, and R. B. Long.
Publication No. EPA-600/2-78-138, July, 1978. 150 p, 51 fig, 82 tab, 59 ref.

Descriptors: Irrigation, Soil conservation, Water quality, *Salinity, Economic analysis, Management, *Nutrients, *Sediments, *Return flow.

Field studies were conducted in two southern Idaho areas to determine the effects of different management practices on the quality and quantity of the runoff from surface-irrigated fields. Pollutant removal systems (primarily mini-basins, vegetated buffer strips and sediment retention ponds) were installed at some of the study sites and evaluated to determine their effectiveness in removing sediment and other materials from return flows. The results indicate that water, sediment and nutrient losses from surface-irrigated areas can be greatly reduced or eliminated by the use of certain types of management practices and/or pollutant removal systems. Linear programming models were used to determine the economic impacts of using different types of practices to control surface runoff and sediment losses from model farms. The results indicate that sediment losses from surface-irrigated fields can be reduced by as much as 50 percent at modest cost. Elimination of surface runoff and sediment losses would require the use of sprinkler irrigation systems and would decrease net income by about 15 percent. Some of the overall impacts of pollutant losses from surface-irrigated areas were evaluated. The annual cost of removing sediment from canals and ditches in the Boise Valley was found to be about $20 per hectare. Irrigation return flows contribute to water quality problems in the Boise River and downstream in the Snake River. (Skogerboe-Colorado State)
W79-02501

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION, VOLUME 1: IN-PLANT CONTROL OF POLLUTION.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer
For primary bibliographic entry see Field 5D.
W79-02504

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION VOLUME 2; WASTEWATER TREATMENT SYSTEMS.
Metcalf and Eddy, Inc., Boston, MA.
For primary bibliographic entry see Field 5D.
W79-02505

FEDERAL GUIDELINES: INDUSTRIAL COST RECOVERY SYSTEMS, MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 651, Price codes: A03 in paper copy, A01 in microfiche. Report No. MCD-45, February 1976. 31 p, 3 tab, 2 append.

Descriptors: *Waste water treatment, *Federal Water Pollution Control Act, *Cost repayment, Cost analysis, Cost allocation, Federal project policy, Grants, Municipal wastes, Construction grants, Treatment facilities

The Federal Water Pollution Control Act Amendments of 1972 extended the construction grants program and imposed new requirements on grant applicants necessitating guidelines for industrial cost recovery (ICR). General requirements for step 2 (preparation of construction drawings and specifications) and step 3 (fabrication and building of a treatment works) grant applications are summarized, and the required documentation for step 3 grant approval is discussed. Other areas covered include: appeal procedure; computation of ICR payments; reserved capacity; exclusions from application of ICR system; ICR examples; new industry; monitoring; discontinuance of use by industrial user; lump sum ICR payments; state agency reviews; conflicts between local laws and Federal ICR requirements; and implementation of approved ICR systems. It is noted that the appendicies are intended as part of these guidelines and should be used as such. (Davison-IPA)
W79-02508

IDENTIFICATION AND INITIAL EVALUATION OF IRRIGATION RETURN FLOW MODELS,
Irrigation Hydrology Co., Fort Collins, CO

For primary bibliographic entry see Field 6A.
W79-02510

EVALUATION OF THE WYOMING WATER SUPPLY PROGRAM.
Environmental Protection Agency, Denver, CO. Air and Water Programs Div.
For primary bibliographic entry see Field 5F.
W79-02512

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES, UNITED STATES STEEL CORPORATION, IRVIN PLANT, PITTSBURGH, PENNSYLVANIA, AUGUST 18-28, 1975.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5B.
W79-02515

FINANCIAL IMPLICATIONS OF WASTE MANAGEMENT SYSTEMS FOR SHELLFISH PROCESSING,
Georgia Univ., Athens.
R. M. North, and F. M. Lyda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 742, Price codes: A02 in paper copy, A01 in microfiche. Report No. NOAA-76042112, December 1975. 8 p, 4 tab, 6 ref. Reprinted from Journal of Agricultural Economics, December 1975. SG-04-3-158-6.

Descriptors: *Shellfish, *Industrial wastes, *Waste water treatment, *Cost analysis, Shrimp, Economic analysis, Capital costs, Maintenance costs, Operating costs, Replacement costs, Effluents, Biological oxygen demand, Food processing industry, Treatment facilities.

The problems encountered by the shellfish processing industry in its effort to meet the rising costs of maintaining low pollution standards are discussed. Emphasis is on demonstrating the cash flow basis implications of private construction of waste water treatment facilities for processing firms with regard to their present technological state in waste water treatment, expected effluent standards, residuals recycling, and capital markets. Although various altenatives are available for firms facing compliance with Federal or state effluent standards, it is recommended that consideration be given to initial capital outlay, operation, maintenance and replacement charges, depreciation, tax advantages and methods of financing. It is concluded that the most important of these factors is the expected cash flow of an in-plant treatment system relative to the alternative of municipal treatment expenditures. Each firm must weigh the risks of escalating municipal charges against rising construction, operating maintenance, and replacement costs, and the firm's ability for effective management of the treatment system regarding effluent standards. (Davison-IPA)
W79-02516

UPGRADING DIARY PRODUCTION FACILITIES TO CONTROL POLLUTION -- IN-PLANT CONTROL OF WASTE,
Cornell Univ., Ithaca, NY. DePt. of Food Science.
R. R. Zall, and W. K. Jordan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 815, Price codes: A05 in paper copy, A01 in microfiche. Presented at the Environmental Protection Agency Technology Transfer Design Seminar, Madison, WI, March 1973. 82 p, 21 fig, 9 tab, 73 ref, 1 append.

Descriptors: *Dairy industry, *Waste dilution, *Pollution abatement, Detergents, Biological oxygen demand, Equipment, Industrial wastes, Industrial production, Management, Operations, Milk, Milk products, Instrumentation, Agricultural wastes, Monitoring, Water reuse, Waste treatment, Cost analysis, Economic efficiency, Profit, Separation techniques, Monitoring.

The relationship between selected food plant problems and in-plant control of waste and pollution is discussed. In a case study, a New York State dairy plant was subjected to measures emphasizing in-plant actions to minimize waste production, and waste volume was reduced by 50%. Waste reduction involves all in-plant production phases, and personnel education and reeducation. Other measures contributing to waste reduction include partial segregation of the rinsings from lines and equipment, reuse of some detergents and the determination of inefficient areas of plant operation through the use of temperature recorders, conductivity scanners, and weir measuring devices. It is concluded that a new source of revenue can be produced through reduction in waste handling costs and in-plant savings of raw material. (See also W79-02519) (Davison-IPA)
W79-02518

UPGRADING DAIRY PRODUCTION TO REDUCE POLLUTION -- CHOOSING THE OPTIMUM FINANCIAL STRATEGY FOR POLLUTION CONTROL,
Commins (J. A.) and Associates, Inc., Fort Washington, PA.
U. M. Patankar, and C. R. Marshall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 816, Price codes: A04 in paper copy, A01 in microfiche. Presented at the Environmental Protection Agency Technology Transfer Seminar, Madison, WI, March 20-21, 1973. 70 p, 10 fig, 6 tab.

Descriptors: *Dairy industry, *Water pollution abatement, *Cost-benefit analysis, Tax rates, Government finance, Legal aspect, Legislation, Federal Water Pollution Control Act, Water pollution control, Financing, Sewage treatment, Industrial waste treatment, Cost analysis, Municipalities, Technology transfer, Water pollution, Agricultural wastes, Investment, Depreciation.

Tax and financing strategies for dairy processing firms to economically finance pollution control equipment are discussed. A method is also presented for financially analyzing whether dairy processors should, when the choice is available, use on-site treatment or send pretreated wastes to a municipal system. It is pointed out that pollution control equipment costs are exempt from certain sales, use and property taxes through tax-exempt financing or adjustment in company income taxes by the addition of special depreciation alternatives. Other incentives include the possibility of government treatment of wastes at lower costs than self-treatment through Federal Government grant programs. To aid companies in making sound management decisions related to pollution control expenditures: standard depreciation for pollution control facilities are discussed; the costs of different methods of financing pollution control equipment are examined; financing and tax strategies for equipment are related to company financial strategies; and the availability of the various financing alternatives from the Federal government and from five mid-western states in which the greatest amount of dairy processing takes place are surveyed. (See also W79-02518) (Davison-IPA)
W79-02519

INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).
American Management Systems, Inc., Arlington, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 863, Price codes; A03 in paper copy, A01 in microfiche. Final Report No. EPA-570/9-76-002-4, June 15, 1976. 33 p, 9 fig, 9 tab. 68-01-1968.

Descriptors: *Water quality control, *Model State Information System, *Monitoring, *Computer programs, Safe Drinking Water Act, Data collections, Data transmission, Drinking water, Legislation, Reporting, State jurisdiction, Water quality, Standards, Law enforcement, Water supply, Potable water, Documentation, Regulations.

The Model State Information System (MSIS), a computer-based information system, is designed for states which do not have an automated system for managing the water quality data required by the National Interim Primary Drinking Water Regulations. The states will have the option of choosing the basic package consisting of the Public Water Supply Inventory subsystem, Water Quality Compliance subsystem, Regulations subsystem, and Federal Reporting subsystem, plus one or more optional features. The optional features are: variances and exemptions subsystem, enforcement action subsystem, sanitary survey subsystem, and operator and mailing subsystem. The MSIS will reduce the states' administrative costs in implementing the regulations through computer-based techniques. Costs of software development training and installation will be reduced by the EPA developed system rather than a custom built system. Each of the elements of the water quality compliance subsystem is summarized, key reports are tabulated, and a schematic diagram of its function is provided. The MSIS process sequence is discussed from preparation of the operational environment through its entire production including the optional features. A sample operating schedule is provided. (See also W79-02521) (Davison-IPA)
W79-02520

'BEST MANAGEMENT PRACTICES' FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker, G. V. Skogerboe, and R. G. Evans.
Publication No. EPA-600/2-78-162 July, 1978. 113 p, 21 fig, 11 tab, 46 ref.

Descriptors: Irrigation, Fluid infiltration, *Salinity control, Seepage, Water distribution, Water loss, Water pollution, *Water quality control, Sprinkler irrigation, *Colorado, *Grand Valley(Colo), *Return flow.

A nontechnical summary of several research activities in the Grand Valley is given. Analyses of alternative measures of reducing the salt load originating from the Valley as a result of irrigation return flows are presented. These alternatives include conveyance channel linings, field relief drainage, on-farm improvements (such as irrigation scheduling, head ditch linings, sprinkler and trickle irrigation), economic control measures such as taxation and land retirement, modified legal constraints, and collection and treatment of return flows with desalting systems. The best management practices for salinity control in the Grand Valley should be primarily the structural rehabilitation and operational modification of the local irrigation system lying below the turnouts from the major canal systems. Canal linings appear in the optimal strategies at higher levels of valley-wide salinity control emphasis but only so far as lining the Government Highline Canal is concerned. Desalting would become a cost-effective alternative after major irrigation system improvements are implemented. (Skogerboe-Colorado State)
W79-02521

SOME IMPACTS OF SAFE DRINKING WATER STANDARDS ON RURAL WATER SYSTEMS,
Mississippi State Univ., Mississippi State. Div. of Business Research.
L. R. Cheatham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 370, Price codes: A06 in paper copy, A01 in microfiche. Mississippi State University Report 1978, 99 p, 26 tab, 24 ref. OWRT A-111-MISS(1), 14-34-0001-8026.

Descriptors: *Water quality standards, *Water works, *Water costs, *Water treatment, *Treatment facility, *Water law, *Water quality control, *Public utilities, Water demand, Water delivery, Water management, Water pollution sources, Groundwater pollution, Coliform, Disinfection, Filtration, Chlorination, *Potable water, *Mississippi, *Small rural water systems, Water associations, Financial position data, *Drinking water regulations, Treatment costs, Monitoring costs,

Compliance costs, Economies of scale, Customer rates.

Timetable for compliance with National Interim Primary Drinking Water Regulations is such that violation notices sent to systems have thus far been limited to those for bacteria MCLs. In Mississippi this is expected to be the only standard of significant impact. Usage of treatment equipment by systems serving populations of less than 1000 is very limited. Large-percentages of these systems will have to purchase new disinfection equipment to reduce coliform content to the acceptable MCL. Greatest frequency of violations has occurred among the smallest systems. Compliance costs per customer will be greatest among the smaller systems because of high fixed costs of remedies with costs per customer declining as number of customers increase. Projected customer rate increased to compensate for high compliance costs for some small systems are higher than most customers are willing to accept for water quality improvements. Cost increases could result in some systems ceasing operations. In rural areas where customers have an alternative of switching to family wells if system rates become expensive, total revenues may decline because of loss of customers. If small privately owned systems are unable to pass cost increases along to customers, some owners will experience operating losses.
W79-02522

ENVIRONMENTAL IMPACT ASSESSMENT.
Lyndon B. Johnson School of Public Affairs, Austin, TX.
For primary bibliographic entry see Field 6G.
W79-02524

EMERGENCY SUSPENSION PROCEDURES FOR OUTER CONTINENTAL SHELF OIL AND GAS OPERATIONS,
Geological Survey, Washington, DC.
Federal Register, Vol. 42, No. 192, p 53956-59, October 4, 1977.

Descriptors: *Continental shelf, *Oil pollution, *Oil spills, *Regulation, Oil industry, Leases, Legal aspects, Water law, Oily water, Water pollution sources, Adoption of practices, Administration.

Promulgated in September, 1977, this federal Department of the Interior rule applies to all Outer Continental Shelf (OCS) oil and gas leases issued after publication. The rule supplements existing OCS oil and gas operations suspension procedures by specifying study methods of threats of significant irreparable damages, designating the procedure for establishing mitigation measures, and redefining property rights granted with a lease. If adequate mitigating measures cannot be designed, the Secretary of the Interior may, in specified circumstances, terminate an emergency suspension and allow a lease term to run without renewal of operations. Termination of suspension does not imply approval of operations on the lease. Although lessees will conduct and bear the cost of necessary studies, the Supervisor's approval of study plans should protect federal interests. While the Department of the Interior has no authority to exercise the power of eminent domain and pay compensation therefore on the OCS, the Department does not 'take' property rights in the constitutional sense when it exercises rights reserved when a lease was issued. Rights previously granted are not subject to taking without legislation. (Rule-Florida)
W79-02532

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS: PHOSPHATE ROCK MINING,
Federal Register, Vol. 43, No. 48, p 9808-10, March 10, 1978.

Descriptors: *Standards, *Phosphates, *Pollution abatement, *Industrial wastes, Mining, Mineral industry, Navigable waters, Federal water pollution control act, Regulation, Permits, Fluorides, Effluents.

These source performance standards limit the discharge of pollutants into navigable waters from phosphate rock mining and processing operations that are determined to be new sources. This is in compliance with requirements of the Federal Water Pollution Control Act. The standards are to be incorporated in National Pollutant Discharge Elimination System permits issued to new sources by the federal Environmental Protection Agency (EPA) or by states with EPA approved programs. These regulations apply to any applicable operation, the construction of which is commenced after the publication of proposed new EPA regulations. The effect of these regulations will be to require treatment of waste water discharged from new source phosphate mining and processing operations in the mineral mining industry. The regulations establish new source performance standards for total suspended solids and pH. The regulations call for the use of best available demonstrated control technology for controlling the discharge of process-generated waste water pollutants. The limitations for the phosphate mining and processing subcategory are applied on a concentration basis rather than a mass basis. Additional waste water pollutants which are controlled are radiological parameters, fluoride and phosphates. (Quarles-Florida)
W79-02534

LEGISLATION AND REGULATION: WHAT'S NEW WITH PL 92-500,
C. W. Heckroth.
Water and Wastes Engineering, Vol. 15, No. 1, p 17-32, 1978.

Descriptors: *Legislation, *Water quality act, *Waste water treatment, *Evaluation, Water quality, Chlorination, Technology, Grants, Waste water(Pollution), Toxins, Oil spills, Disinfection.

Congress has finally passed the compromise measure known as the 1977 Clean Water Act and which is now ready for President Carter's signature. This article delves into all aspects of this compromise measure. The new changes contain more flexibility than previous measures. Although everyone is not happy with the compromise, it appears that most people are. The article examines the numerous changes made to the law in detail. The new measures are seen as more practical than the old requirements. Some environmentalists are unhappy because some delays are inherent in the law. However, the basic regulatory framework is intact. The major points of the new amendments are: (1) an extension of the compliance deadline for best practical technology standards in certain circumstances; (2) a one-year extension of the compliance deadline for best abailable technology; (3) regulation of some toxic chemicals and other pollutants; (4) allocation of almost $25 billion for five years of cleanup; and (5) authority to grant treatment facility grants. The article also discusses specially selected areas of the Act which have constantly revitalized ongoing programs. These include disinfection techniques, hazardous wastes and areawide water quality planning programs. (Quarles-Florida)
W79-02537

THE CLEAN WATER ACT OF 1977,
R. M. Hall, Jr.
Natural Resources Lawyer, Vol. 11, No. 2, p 343-72, 1978.

Descriptors: *Federal water pollution control act, *Legislation, *Planning, *Analysis, Construction, Grants, Technology, Toxins, Standards, Pollutants, Oil, Permits.

The 1977 Clean Water Act amends a number of significant aspects of the 1972 Federal Water Pollution Control Act Amendments. This article reviews and analyzes the major features of these new amendments. The 1977 amendments reflect extensive fine tuning of a complex statute. During the five years since the 1972 amendments were passed, the Environmental Protection Agency and the courts have been grappling with implementation problems. These arise from both practical difficulties and statuory ambiguity. The 1977 amendments ease many of these problems. The new amendments also impose additional responsibilities on various government agencies which have the duty of implementation. The legislation also imposes new requirements on industries and others who must comply with the Act. Additional burdens are placed upon the nation's taxpayers who must bear the ultimate financial burden of cleaning up the nation's waters. The author suggests that the new amendments will raise new problems of statutory interpretation. The article includes background on the 1972 amendments' effect, as well as the legislative history of the 1977 amendments. (Quarles-Florida)
W79-02538

TIDELANDS AND THE PUBLIC TRUST: AN APPLICATION FOR SOUTH CAROLINA,
For primary bibliographic entry see Field 6E.
W79-02539

THE WATER QUALITY IMPROVEMENT ACT OF 1970, THE 1972 AMENDMENTS AND STATE ANTIPOLLUTION LAWS,
D. R. Villareal, Jr.
The Forum, Vol. 13, No. 2, p 438-51, Winter 1978.

Descriptors: *Water quality act, *Oil spills, *Remedies, *Penalties(Legal), Legislation, Legal aspects, Water law, State jurisdiction, Federal jurisdiction, Statutes, Regulation, Water pollution.

Under the 1970 Water Quality Improvement Act and the Act's 1972 amendments, the person in charge of an offshore or onshore facility or a vessel, has a duty of reporting any discharge of oil in harmful quantities into or upon the navigable waters of the United States, adjoining shore lines, or waters of the contiguous zone. The U.S. Coast Guard has been designated as the appropriate agency to report to. However, there may also be a duty to report to a state authority. While the President is authorized to remove spilled oil--unless he determines that it will be done properly by those responsible for it--there is no mandate in the Act that the spilled oil be cleaned up. If the President orders the oil removed, removal costs are recoverable from the spiller. There are criminal sanctions for violations of the Acts, in addition to sanctions still in effect under the 1899 Refuse Act. Civil penalties and damage liability may also be assessed. Because Puerto Rico and the 22 coastal states have also enacted reporting, cleanup and damages statutes, there is some overlap of federal and state legislation. (Rule-Florida)
W79-02542

BANNING DETERGENT PHOSPHATES - THE DEBATE CONTINUES,
S. J. Hadeed.
Journal of the Water Pollution Control Federation, Vol 50, No 2 p 190-92, 1978.

Descriptors: *Great Lakes region, *Eutrophication, *Phosphates, *Detergent, Great Lakes, Phosphorus, Nutrients, Nutrient removal, Municipal wastes, Canada, Waste water treatment, Water chemistry.

The release of a paper prepared by the federal Environmental Protection Agency (EPA) Region V Phosphate Committee titled 'Detergent Phosphates Ban' has re-ignited the old controversy over banning detergent phosphates. The paper recognizes that phosphorus is the primary nutrient responsible for lake eutrophication and advocates that states in the Great Lakes Basin adopt a ban on phosphorus in detergents. Phosphorus has been identified as the cause of advanced eutrophication in the Great Lakes. The detergent industry has reacted strongly in opposition to such a ban, contending such a restriction alone will not relieve the Great Lakes region of its eutrophication problems. Past EPA policy is explained, including the United States-Canada agreement limiting phosphorus discharges by municipal treatment plants. The deter-

gent industry argues that the technology to remove phosphorus from wastewater is available, and a ban is not justifiable. The search for alternatives to phosphate detergents is explained, as well as the economic impact of a phosphate ban. The latest legislative maneuvering on the issue is revealed, and the conclusion reached that no major advances are in sight. (Quarles-Florida)
W79-02543

CONSUMER NOTIFICATION - PUBLIC AWARENESS OR THE SMOKING PISTOL,
California State Dept. of Health, Berkeley.
J. M. Gaston.
Journal of the American Water Works Association, Vol. 69, No. 11, p 574-76, 1977.

Descriptors: *Public utilities, *Administrative decisions, *Water quality control, *Potable water, Water supply, Water quality standards, Water quality, California, Public health, Administration, Regulation, Legislation.

The expressed purpose of the federal Safe Drinking Water Act is to assure that water-supply systems serving the public meet minimum national standards for protection of public health. The mandatory public notification provision contained in the Act has caused much consternation in the water-supply industry for utility members and regulatory agencies. No one is sure what to expect from consumers, state regulatory agencies or the federal Environmental Protection Agency (EPA). The article examines the activities of the California State Department of Health as they relate to the consumer notification requirements that presently exist. In this way, some of the problems and opportunities that lie in the future may be revealed. The two specific instances where the Department might require a utility to notify the public are: (1) when there is a water quality emergency resulting in a total system contamination; and (2) when the Department decides that public interest requires notification. The latter instance is the most controversial and may occur for various reasons. The author concludes that the EPA wishes to provide national policy and guidance and that utilities are expected to be responsible for providing clean water. (Quarles-Florida)
W79-02545

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Environmental Protection Agency, Washington, DC. Criteria and Standards Div.
R. K. Ballentine.
Water and Sewage Works, Vol. 125, No. 4, p 68-70, 1978.

Descriptors: *Groundwater, *Groundwater resources, *Legislation, *Federal water pollution control act, Federal government, Water management(Applied), Conservation, Water quality, Toxins, Administrative agencies, Evaluation, Water policy.

Federal statutes dealing with groundwater quality protection, even ones having peripheral impact, are discussed here in detail. The Safe Drinking Water Act, perhaps the law with the greatest impact in this area, is omitted from discussion. The statutes discussed are: (1) the 1972 Federal Water Pollution Control Act Amendments (FWPCA); (2) the Toxic Substances Control Act; (3) the 1976 Resource Conservation and Recovery Act; (4) the 1969 National Environmental Policy Act; and (5) two executive orders on the subject. Control of groundwater quality protection on federal lands and federal facilities is also discussed. The FWPCA requires waste-treatment management plans to include processes necessary to control groundwater quality. States are required to enforce any groundwater provision of any Section 208 agency. The federal Environmental Protection Agency (EPA) is required to issue guidelines for methods to control pollution resulting from the disposal of pollutants in subsurface excavation. The EPA may delegate to the states the power to issue permits controlling the disposal of pollutants into wells. The impact on groundwater protection by the other legislative acts is also discussed in detail. (Quarles-Florida)
W79-02546

NONDETERIORATION AND THE PROTECTION OF HIGH QUALITY WATERS UNDER FEDERAL WATER POLLUTION CONTROL LAW,
Utah Law Review, Vol. 1977, No. 4, p 737-57, 1977.

Descriptors: *Federal water pollution control act, *Degradation(Stream), *Water quality control, *Analysis, Water quality, Water quality standards, Legislation, Federal government, Regulation, Judicial decisions, Economics, Evaluation.

The policy of prevention of significant deterioration of high quality water, which arose from the 1972 Federal Water Pollution Control Act Amendments, has received scant attention. This may be a sign that the Federal Environmental Protection Agency (EPA) has satisfied all rival camps, or perhaps it indicates that the policy's potential has not been fully realized. This article explores the nondegradation policy of the Act and the legal foundation for its implementing regulations. The language used by the EPA in its implementing regulations is examined along with the adequacy of the protection afforded high quality waters by the regulations. The author concludes with suggested methods to protect high quality waters. The regulations preventing degradation are ambiguous and nonspecific, tending to result in weak enforcement. Furthermore, the EPA has vested much discretion in the states resulting in national irregularity. The author suggests quality waters. Adoption of the following is urged: (1) more clearly defined procedures for public participation; (2) intergovernmental input; (3) federal intervention; and (4) EPA review of policy decisions. (Quarles-Florida)
W79-02547

NIAGRA OF WISCONSIN PAPER CORP. V. WISCONSIN DEPT. OF NATURAL RESOURCES (STATE EFFLUENT DISCHARGE PERMITS MUST BE MODIFIED IN ACCORDANCE WITH STATE LAW TO COMPLY WITH EPA STANDARDS.
For primary bibliographic entry see Field 6E.
W79-02560

CONCERNED CITIZENS FOR ORDERLY PROGRESS V. COMMONWEALTH OF PENNSYLVANIA, DEPT. OF ENVIRONMENTAL RESOURCES (SEWAGE FACILITY CONSTRUCTION PERMIT UPHELD).
For primary bibliographic entry see Field 6E.
W79-02569

WESTERN WATER LAWS AND IRRIGATION RETURN FLOW,
Resources Administration and Development, Inc., Fort Collins, CO.
G. E. Radosevich.
Publication No. EPA-600/2-78-180, August, 1978. 257 p, 5 fig, 3 tab, 107 ref, 1 append.

Descriptors: *Water law, *Water rights, Irrigation, Irrigated land, Water pollution, Water quality, *Return flow, Prior appropriation.

The impact of water law upon allocation and use of waters within the Western United States is currently recognized as one of the major constraints to adaptation by irrigated agriculture of more efficient operation practices. This project provides a background of the law and evaluation of the potentials through water law interpretations or changes to implementing improved water management technology. Specifically, this report provides a synthesis of water laws of each of the 17 western states, as well as providing a state-by-state account of the water quantity laws, paying particular attention to features in the laws and their administration that direct the manner of use and provide incentives or disincentives to more efficient use. General recommendations are offered that will permit or induce more efficient and effective water management. Specific recommendations identify areas requiring additional research to renovate state water laws consistent with present and prospective policies and needs. (Skogerboe-Colorado State)
W79-02575

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1976, SIXTH ANNUAL ISSUE,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 10C.
W79-02580

THE USE OF POTASSIUM PERMANGANATE (KMNO4) IN FISHERIES; A LITERATURE REVIEW,
Fish and Wildlife Service, Fayetteville, AR. South Central Reservoir Investigations.
T. O. Duncan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 397, Price codes: A04 in paper copy, A01 in microfiche. Fish and Wildlife Service, Division of Fishery Research, Report No. FWS-LR-74-14 (Revised), 54 p, 1978. 4 tab, 129 ref.

Descriptors: *Potassium compounds, *Salts, *Manganese, *Fish hatcheries, Disinfection, Fish management, Fish parasites, Fish physiology, Fish diseases, Fungicides, Algicides, Piscicides, Rotenone, Antimycin A, Dissolved oxygen, Oxygen sag, Chemical analysis, Chemical properties, Aquiculture, Toxicity, *Bibliographies, *Potassium permanganate, *Permanganates.

Potassium permanganate is one of the most widely used inorganic chemicals in the world. Since its first use in fish culture in 1893, potassium permanganate has been used primarily as: (1) a disinfectant in fish hatcheries for aquatic plants, aquaria, raceways, ponds, and water supplies; (2) for removal of fish parasites; (3) to reduce disease, or as a disease preventative, especially on wounds of fish; (4) for detoxification of fish toxicants such as rotenone, and antimycin; (5) for fungus and algae control; and (6) temporary oxygen depletion problems in ponds. In foreign countries, potassium permanganate is used for removal of parasites before the live fish is sent to market, as well as a disinfectant. (EIS-Deal)
W79-02585

A BIOMONITORING PROCEDURE UTILIZING NEGATIVE PHOTOAXIS OF FIRST INSTAR AEDES AEGYPTI LARVAE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W79-02593

EVALUATION OF IRRIGATION METHODS FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
R. G. Evans, W. R. Walker, G. V. Skogerboe, and S. W. Smith.
Publication No. EPA-600/2-78-161, July, 1978. 172 p, 50 fig, 8 tab, 150 ref.

Descriptors: Irrigation, *Salinity control, Saline soils, *Water quality control, Water pollution, Water loss, *Colorado, *Grand Valley(Colo), *Return flow.

Irrigation return flows in the Upper Colorado River Basin carry large salt loads as a result of contact with the saline soils and the marine derived geologic substratum. The Grand Valley of Western Colorado is a major contributor to the salinity problems of the basin and is, therefore, a logical region to test the effectiveness of agricultural salinity control alternatives. This study emphasized the implementation of on-farm salinity control alterna-

tives; primarily evaluating irrigation scheduling, furrow irrigation, sprinkler irrigation, and trickle irrigation. Border irrigation was also evaluated, but was not implemented as part of this study. The cost-effectiveness of the various on-farm alternatives in the Grand Valley is summarized and presented in this report. (Skogerboe-Colorado State)
W79-02594

AVIAN COMMUNITIES AND HABITAT COMPONENTS IN NATURAL AND WASTEWATER-IRRIGATED ENVIRONMENTS,
Pennsylvania State Univ., University Park.
S. J. Lewis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 393, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, November, 1977. 143 p, 8 fig, 21 tab, 173 ref, append. OWRT B-084-PA(3), 14-34-0001-6113.

Descriptors: *Birds, *Waste water(Irrigation), *Pennsylvania, Habitats, Seasonal, *Avian population, *Spray irrigated, *Municipal sewage effluent, Arthropod, *Foliage height diversity, *Effluent spraying, Vegetative succession, Environmental conditions, Herbaceous vegetation, Red-winged Blackbird, Habitat changes.

Avian populations, guilds, and communities were monitored in old field (OF), aspen-pine-shrub (APS), and mixed oak (MO) habitats in Pennsylvania. Portions of the Study area had previously been spray-irrigated with municipal sewage effluent. The objectives of this study were to determine relationships between birds and selected habitat components (vegetative structure and arthropod abundance) and to evaluate how these changed with year, season, vegetative succession, and habitat treatment (wastewater irrigation). Within the successional gradient of the OF, APS, and MO areas, the following patterns were noted. As succession advanced, upper vegetative strata became more prominent and shading caused low vegetation to decline. Associated with the progressive loss of herbaceous vegetation was a decrease in the abundance of arthropods. Total vegetative cover increased with succession. Total breeding bird abundance declined with succession. Bird species diversity (BSD) increased with foliage height diversity. The abundances of bird species using specific vegetative strata for nesting and foraging were directly related to the quantity of foliage available in those strata. Although wastewater irrigation of APS and MO vegetation had ceased one and two years before this study, numerous habitat changes caused by the process were still evident. Avian community abundance, dominance, and evenness changed significantly with effluent spraying. (Sink-Penn State)
W79-02601

NEPA'S EFFECT ON THE CONSIDERATION OF ALTERNATIVES: A CRUCIAL TEST,
Stanford Univ., CA. Dept. of Civil Engineering.
W. W. Hill, and L. Ortolano.
Natural Resources Journal, Vol. 18, No. 2, p 285-311, April 1978. OWRT-C-4080(No 9017)(3), 14-31-0001-9017.

Descriptors: *Water resources planning, *Alternatives, Evaluation, *Water law, *Nonstructural alternatives, Soil Conservation Service, Army Corps of Engineers, National Environmental Policy Act, Council on ENvironmental quality, Environmental specialists, Interdisciplinary planning.

An examination was made of the National Environmental Policy Act's (NEPA) effects and effectiveness in two federal water resources planning programs: the small watershed program of the U.S. Department of Agriculture's Soil Conservation Service (SCS) and the survey investigation program (preauthorization studies) of the U.S. Army Corps of Engineers (Corps). Results from that portion of the research dealing with NEPA's influence on the formulation and evaluation of alternatives are presented. These results are based on data obtained from questionnaire surveys mailed in 1974 to all Corps District officers and SCS State officers. The data collected are used to conclude that the Corps and SCS planning studies underway in early 1974, NEPA had not greatly affected either the types of alternatives being considered or who and what influenced the formulation and evaluation of these alternatives.
W79-02607

TROPHIC INTERACTIONS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
For primary bibliographic entry see Field 5C.
W79-02610

ECOLOGICAL EFFECTS OF AN ARTIFICIAL ISLAND, RINCON ISLAND PUNTA GORDA, CALIFORNIA,
Dames and Moore, Los Angeles, CA.
For primary bibliographic entry see Field 6G.
W79-02614

A BIOLOGIST LOOKS AT OIL IN THE SEA,
Dalhouse Univ., Halifax (Nova Scotia). Dept. of Biology.
K. H. Mann.
Shore & Beach, Vol. 46, No. 4, p 27-29, October 1978.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Arctic, Water pollution effects, Baseline studies, Shores, Coasts, *Outer Continental Shelf, Petroleum development.

Nature is extremely variable and we have to survey the whole range of this natural variability before making comparison with a polluted situation. It is now known how much harm is done by an oil slick in the open sea, but when it comes ashore there is trouble in plenty. When oil comes ashore this highly productive area is damaged in differing degrees according to the type of oil and the type of community that lives there. The biological decomposition of oil and the recolonization process are both functions of the metabolism of marine organisms, and this is slower in colder waters. Hence, it is safe to say that the recovery period for oiled arctic shorelines would be well in excess of ten years. It has been shown repeatedly, that the number of species of plant and animal present, i.e. the species diversity, in an area after an oil spill is lower than that found in uncontaminated areas. For our knowledge of biological variability it is highly probable that information obtained about a species occurring in temperate waters is not applicable to the same, or a related species that may be living in the arctic environment. Food chains in Arctic waters are made up of rather few species, so that elimination of a key species could cause a major disruption in the productivity of species that serve as food for native peoples, and the dangers appear even more ominous. Considering the Arctic in particular, it does seem that the dangers of very serious impairment of the functioning of natural marine systems there are very real indeed. (Sinha-OEIS)
W79-02615

VULNERABILITY OF COASTAL ENVIRONMENTS TO OIL SPILL IMPACTS,
South Carolina Univ., Columbia.
E. R. Gundlach, and M. O. Hayes.
Marine Technology Society Journal, Vol. 12, No. 4, p 18-27, August-September 1978. 1 fig, 3 tab, 55 ref. NSF-ENV76-068-98-A02.

Descriptors: *Oil spills, *Coasts, *Water pollution effects, Resources development, Environmental effects, *Outer Continental Shelf, Vulnerability index, Residence time.

Contingency planning for potential oil spills is becoming a necessity for most of the coastal waterways of the United States. An important part of a usable contingency plan is the protection of those coastal environments most likely to be seriously damaged by oil contamination in the event of a spill. On the basis of field studies of five major oil spills and a review of the literature, major coastal environments have been classified on a scale of 1 to 10 in terms of potential vulnerability to oil spill damage. The scale emphasizes oil residence time, with consideration of initial biological impacts. Exposed rocky headlands and wave-cut platforms (1 and 2 on the Vulnerability Index) are generally lest affected by an oil spill. Coarse-grained sandy and gravel beaches, which are subject to oil penetration and burial, are assigned intermediate index values of 4 to 7. Sheltered environments such as sheltered rocky coasts, salt marshes, and mangroves (index values of 8 to 10) are the environments most likely to be adversely affected by oil spills. For example, residence times of over 10 years are predicted for some salt marsh areas. (Sinha-OEIS)
W79-02616

IMPLEMENTATION OF AGRICULTURAL SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
R. G. Evans, W. R. Walker, G. V. Skogerboe, and C. W. Binder.
Publication No. EPA-600/2-78-160, July, 1978. 193 p, 62 fig, 29 tab, 46 ref.

Descriptors: Irrigation, Ditches, Irrigation canals, *Salinity control, Saline soils, Salt water, Seepage, Water distribution, *Water quality control, Agricultural runoff, *Return flow.

A summary of the results of applied research on salinity control of irrigation return flows in the Grand Valley of Colorado is presented for the period of 1969 to 1976. Salinity and economic impacts are described for the Grand Valley Salinity Control Demonstration Project which contains approximately 1,600 hectares and involves most of the local irrigation companies in the Valley During the eight years of the demonstration project, 12.2 km of canals were lined, 26.54 km of laterals were lined, 16,400 meters of drainage tile were installed, a wide variety of on-farm improvements were constructed, and an irrigation scheduling program was implemented. On-farm improvements evaluated were solid-set sprinklers, side-roll sprinklers, drip (trickle) irrigation, furrow irrigation, and automatic cut-back furrow irrigation. The total value of the constructed improvements in the demonstration area was about $750,000. The total improvements resulted in a salt reduction of 12,300 metric tons per year reaching the Colorado River This salt reduction results in an annual benefit to downstream water users of nearly $2,000,000. In addition, there are benefits to the local water users with increased crop yields, and to the people of Grand Valley in increased business. (Skogerboe-Colorado State)
W79-02617

ALTERNATIVE POLICIES FOR CONTROLLING NONPOINT AGRICULTURAL SOURCES OF WATER POLLUTION,
Illinois Univ. at Urbana-Champaign.
W. D. Seitz, D. M. Gardner, S. K. Gove, K. L. Guntermann, and J. R. Karr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 757. Price codes: A14 in paper copy, A01 in microfiche Publication No EPA-600/5-78-005, April, 1978. 314 p, 22 fig, 55 tab, 168 ref, 8 append.

Descriptors: Water pollution sources, Soil erosion, Economics, *Alternative planning, Nonpoint pollution sources, Water pollution control, Agricultural runoff, *Return flow.

This study of policies for controlling water pollution from nonpoint agricultural sources includes a survey of existing state and Federal programs, agencies, and laws directed to the control of soil erosion. Six policies representing a variety of approaches to this pollution problem are analyzed. The aggregate economic impact of such policies is investigated using a state-of-the-art, market-equilibrium, linear-programming model of crop production in the corn belt. The economic effects of the policies at the level of individual forms and their

impacts on long-term soil productivity are analyzed through the use of a watershed model. The institutional arrangements needed to implement the policies are examined, as are the associated costs for a typical county. Literature on the social aspects of policy acceptance is reviewed, and the results of a survey of the reaction of farmers and ASCS directors in Illinois to different policies are presented. The equity of the policies is examined and legal precedents are reviewed. (Skogerboe-Colorado State)
W79-02619

INTEGRATING DESALINATION AND AGRICULTURAL SALINITY CONTROL ALTERNATIVES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker.
Publication No. EPA-600/2-78-074, April, 1978. 182 p, 30 fig, 17 tab, 55 ref, 2 append.

Descriptors: Cost effectiveness, *Desalination, Optimization, *Salinity control, Sprinkler irrigation, Water quality control, Alternative costs, *Return flow.

The cost-effectiveness relationships for various agricultural and desalination alternatives for controlling salinity in irrigation return flows are developed. Selection of optimal salinity management strategies on a river basin scale is described as a problem of integrating optimal strategies with individual subbasins and irrigated valleys. Desalination systems include seven processes: (1) multistage distillation; (2) vertical tube evaporation in conjunction with (1); (3) a vapor compression form of (2); (4) electrodialysis; (5) reverse osmosis; (6) vacuum freezing - vapor conveyance linings, irrigation scheduling, automation, sprinkler irrigation systems, and trickle irrigation systems. A case study of the Grand Valley in western Colorado is presented to demonstrate the analysis developed. Results indicate that treatments of the agricultural system are generally more cost-effective than desalting except for high levels of potential salinity control. Lateral linings and on-farm improvements are the best agricultural alternatives. (Skogerboe-Colorado State)
W79-02629

ASSESSING THE SPATIAL VARIABILITY OF IRRIGATION WATER APPLICATIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 3F.
W79-02632

SUBSTITUTE CHEMICAL PROGRAM - INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF METHYL PARATHION.
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
For primary bibliographic entry see Field 5C.
W79-02633

PREIMPOUNDMENT STUDY LITTLE BLACK CREEK DRAINAGE BASN BLACK CREEK WATERSHED BULLOCH COUNTY, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W79-02635

EFFECTS OF CHANNELIZATION OF THE LUXAPALILA RIVER ON FISH, AQUATIC INVERTEBRATES, WATER QUALITY AND FURBEARERS,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 5C.
W79-02636

PROBLEM DEFINITION STUDIES ON POTENTIAL ENVIRONMENTAL POLLUTANTS, IV: PHYSICAL, CHEMICAL, TOXICOLOGICAL, AND BIOLOGICAL PROPERTIES OF BENZENE; TOLUENE; XYLENES; AND P-CHLOROPHENYL METHYL SULFIDE, SULFOXIDE, AND SULFONE.
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 435, Price codes: A05 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Wash. D.C., Technical Report 7605, June 1976. 98 p, 14 tab, 1 fig, 217 ref. Edited T. A. Miller.

Descriptors: Analytical methods, *Birds, *Fish, *Invertebrates, *Mammals, Organic compounds, Microbiology, *Toxicity, Mortality, *Wildlife, Physical properties, Chemical properties, Biological properties, Reviews, Oil, Oil pollution, *Benzene, *Toluene, *Xylene, P-chlorophenyl methyl sulfide, P-chlorophenyl, Methyl sulfoxide, Carcinogenesis.

A data base was established of physical, chemical, toxicological, and biological properties for: benzene, toluene, xylenes, and p-chlorophenyl methyl sulfide, p-chlorophenyl methyl sulfoxide, and p-chlorophenyl methyl sulfone and provides a summary of pertinent information concerning: physical/chemical properties; analytical methods; mammalian toxicology; environmental considerations for wildlife, birds, fish, reptiles, amphibians, invertebrates, Microorganisms, and plants; and existing standards. (EIS-Katz)
W79-02637

SELECTED HYDROLOGIC DATA, 1931-77, WASATCH PLATEAU-BOOK CLIFFS COALFIELDS AREA, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02645

IMPACT OF FLOW REGULATION AND POWER PLANT EFFLUENTS ON THE FLOW AND TEMPERATURE REGIMES OF THE CHATTAHOCHEE RIVER -- ATLANTA TO WHITESBURG, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02648

DISSOLVED-OXYGEN REGIMEN OF THE WILLAMETTE RIVER, OREGON, UNDER CONDITIONS OF BASINWIDE SECONDARY TREATMENT,
Geological Survey, Portland, OR. Water Resources Div.
W. G. Hines, S. W. McKenzie, D. A. Rickert, and F. A. Rinella.
Available from Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202. Circular 715-I, 1977. 152 p, 30 fig, 10 tab, 32 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Dissolved oxygen, *Monitoring, *Low-flow augmentation, Biochemical oxygen demand, Water treatment, Oregon, *Willamette River(Ore), Tertiary treatment.

For nearly half a century the Willamette River in Oregon experienced severe dissolved-oxygen problems related to large loads of organically rich waste waters from industries and municipalities. Since the mid-1950's dissolved oxygen quality has gradually improved owing to low-flow augmentation, the achievement of basinwide secondary treatment, and the use of other waste-management practices. As a result, summer dissolved-oxygen levels have increased, salmon runs have returned, and the overall effort is widely regarded as a singular water-quality success. To document the improved dissolved-oxygen regimen, the U.S. Geological Survey conducted intensive studies of the Willamette during the summer low-flow seasons of 1973 and 1974. During each summer the mean daily dissolved-oxygen levels were found to be higher than 5 milligrams per liter throughout the river. Because of the basinwide secondary treatment, carbonaceous deoxygenation rates were low. In addition, almost half of the biochemical oxygen demand entering the Willamette was from diffuse (nonpoint) sources rather than outfalls. These results indicated that point-source biochemical oxygen demand was no longer the primary cause of dissolved-oxygen depletion. Instead, the major causes of deoxygenation were nitrification in a shallow 'surface active' reach below Salem and an anomalous oxygen demand (believed to be primarily of benthal origin) in Portland Harbor. (Woodard-USGS)
W79-02657

WATER QUALITY IN THE SUGAR CREEK BASIN, BLOOMINGTON AND NORMAL, ILLINOIS.
Geological Survey, Champaign, IL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02660

AN OILSPILL RISK ANALYSIS FOR THE MID-ATLANTIC (PROPOSED SALE 49) OUTER CONTINENTAL SHELF LEASE AREA,
Geological Survey, Reston, VA. Water Resources Div.
J. R. Slack, and T. Wyant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 401, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 78-56, 1978. 72 p, 9 fig, 5 tab, 17 ref, append.

Descriptors: *Oil spills, *Hazards, *Probability, *Continental shelf, *Atlantic Ocean, Mathematical studies, Computer models, Stochastic processes, Simulation analysis, Monte Carlo method, Path of pollutants, Planning, *Outer Continental Shelf lease area.

An oilspill risk analysis was conducted to determine the relative environmental hazards of developing oil in different regions of the mid-Atlantic Outer Continental Shelf lease area. The study analyzed the probability of spill occurrence, likely paths of the spilled oil, and locations in space and time of recreational and biological resources that are likely to be vulnerable. These results are combined to yield estimates of the overall oilspill risk associated with development of the proposed lease area. The analysis implicitly includes estimates of weathering rates and slick dispersion and an indication of the possible mitigating effects of cleanups. Assuming that economically recoverable amounts of petroleum are found in the area, the leasing of the tracts proposed for sale 49 will increase the expected number of spills by about 20-25 percent over the number expected from the existing (sale 40) leases. The probability that an object such as land will be contacted by a spill is increased by at most five percentage points. (Woodard-USGS)
W79-02661

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE,
Matrecon, Inc., Oakland, CA.
For primary bibliographic entry see Field 8G.
W79-02704

ASSESSMENT AND IMPLEMENTATION OF IN-STREAM VALUE STUDIES FOR THE NORTHERN GREAT PLAINS,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W79-02709

LAS VEGAS VALLEY WATER BUDGET: RELATIONSHIP OF DISTRIBUTION, CONSUMPTIVE USE, AND RECHARGE TO SHALLOW GROUNDWATER,
Nevada Univ. System, Las Vegas. Desert Research Inst.
R. O. Patt.
Publication No. EPA-600/2-78-159, July, 1978. 61

p, 16 fig, 8 tab, 19 ref, 3 append.

Descriptors: Groundwater, *Groundwater recharge, *Water consumption, *Return flow, *Consumptive use, Artificial recharge, *Nevada, *Distribution, *Las Vegas Valley(NV).

Estimates of quantity and geographic distribution of recharge to the shallow groundwater zone from water use return flows in Las Vegas Valley were made for the years 1973, 1965, 1968, 1960, and 1943 as part of a broader study on the impact of water and land use on groundwater quality. Considered components of water use in Las Vegas Valley include the following: supply from surface and groundwater; agriculture using potable water; agriculture using sewage effluent; residential lawn watering; lawn watering of parks, schools, cemetaries, hotels, motels; golf courses using potable water; golf courses using sewage effluent water; septic tank recharge; evaporative coolers; system losses' industrial use; power plant cooling; swimming pool use; consumptive use by phreatophytes; in-valley recharge from precipitation, and 'unaccounted for water.' Consumptive use of plants was calculated through use of the Blaney-Criddle method as 3.47 feet per year and recharge was assumed to be the difference between applied water and calculated consumptive use. Data developed during this study indicated consumptive use as determined by this method could be low by 1.5 to 2 feet per year, and thus the following estimates of recharge to the groundwater system are considered maximum, in acre feet: 1973-39,000; 1965-27,600; 1958-26,650; 1950-13,000; and 1943-21,000. (Skogerboe-Colorado State)
W79-02728

NEW CONSIDERATIONS FOR MUNICIPAL WATER SYSTEM PLANNING,
Montgomery (James M.)
For primary bibliographic entry see Field 6B.
W79-02729

TECHNICAL GUIDELINES FOR PUBLIC WATER SYSTEMS.
Clean Water Consultants, El Dorado Hills, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 217, Price codes: A20 in paper copy, A01 on microfiche. Final Report, June 16, 1976. 477 p, 776 ref, 3 append. 68-01-2971.

Descriptors: *Water supply, *Water quality control, *Water treatment, *Water management, Water quality act, Personnel, Design criteria, Water quality standards, Chlorination, Fluoridation, Distribution systems, Planning, Water analysis, Water chemistry, Manuals, Engineering, Systems analysis, Maintenance, Operations, Pumping plants, Water storage.

Technical guidelines for the design, operation, maintenance, staffing and surveillance of public water systems are presented. The manual was prepared to give information on Federal requirements and regulations and as a further guide to professional engineers responsible for the design and construction of public water supplies. Ten sections are developed, each of which has a summary of standards, a discussion of design parameters, and a rationale for standards. The topics covered include: general design considerations, source development, treatment, chemical application, pumping facilities, storage, distribution systems, operation and maintenance, surveillance, and personnel. An extensive bibliography is provided, and three appendices containing a glossary of terms, typical job descriptions, and addresses for obtaining standard documents and references is included. (Davison-IPA)
W79-02787

PROGRAM IMPLEMENTATION PROCEDURES: IMPLEMENTATION OF TWO YEAR POST HIGH SCHOOL WASTEWATER TECHNOLOGY INSTRUCTIONAL PROGRAMS.
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 595, Price codes: A03 in paper copy, A01 in microfiche. 1973. 47 p, 2 fig, 2 tab, 1 append. T-900168.

Descriptors: *Education, *Training, *Waste water treatment technology, *Personnel, Programs, Training procedure, Training institutions, Training requirements, Employment opportunities, Occupations, Waste treatment, Waste water treatment, Plant operations, Education, Schools(Education), Technology transfer.

A revised edition of the 1970 publication, 'Criteria for Establishment of Two Year Post High School Wastewater Technology Programs,' is presented. Experience with this project, originally designed as a federally funded concept, showed that the program could be adapted for any two year post high school institution wanting to provide a program for waste water technicians. The major attributes of such an institution are summarized, and suggestions for administering this program are given. A suggested two year program, including course descriptions prepared in performance terms, is provided. (Davison-IPA)
W79-02789

EVALUATION OF PROPOSED NPDES LIMITATIONS FOR HOMESTAKE MINING COMPANY AND LEAD-DEADWOOD SANITARY DISTRICT NO. 1.
National Inforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 596, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-330/2-75-002, February 1975. 25 p, 1 fig, 6 tab, 10 ref, 1 append.

Descriptors: *Mine wastes, *Sewage districts, *Bioassays, *Cyanide, *Fishkill, Cold water fish, Fisheries, Water pollution, Water pollution effects, Effluents, Waste water treatment, Water quality control, Water pollution control, Water pollution sources, Whitewood Creek, Spearfish Creek, Lead, South Dakota, Toxicity, Chlorides, Chlorine, Simulation analysis.

Results are presented of an investigation: to determine the toxicity of the 1977 effluent conditions as proposed in the NPDES permits to Homestake Mining company and Lead-Deadwood Sanitary District No. 1, Lead, South Dakota; and to determine the suitability of background and receiving waters of Whitewood Creek and Spearfish Creek for support of a cold water fishery. Bioassays of the simulated wastes demonstrated that both effluents are acutely toxic in that test fish were killed within 96 hours. It was indicated that the proposed 1977 permit limitations were inadequate. The combined wastes of the mining company and the sanitary district were considerably more toxic than that of the mining company alone. This was attributed to the complexing of cyanide and chlorine which formed cyanogen chloride. The slime plant and sand plant effluents contained approximtely the same concentrations of cyanide as the simulated wastes; cyanide was found to be the principle toxic agent. Neither heavy metals nor un-ionized ammonia, at levels specified in the 1977 permit, contributed to the toxicity of the tested waters. In situ exposure of rainbow trout demonstrated that Whitewood Creek, in the area upstream from the Gold Run confluence was extremely toxic. (Davison-IPA)
W79-02790

CHARACTERIZATION AND EVALUATION OF WASTEWATER, UNITED STATES STEEL CORPORATION, HOMESTEAD WHEEL AND AXLE PLANT, MCKEES ROCKS, PENNSYLVANIA, AUGUST 21-28, 1975.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 593, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-330/2-76/019, January 1976. 78 p, 7 fig, 16 tab, 2 ref, 5 append.

Descriptors: *Industrial wastes, *Water pollution, *Ohio River, *Pollutant identification, Effluents, Influents, Water quality control, Outfall sewers, Oil, Phenols, Oil wastes, Trace elements, Zinc, Cyanide, United States Steel Corporation, Homestead Wheel and Axle Plant, Mc Kees Rocks, Pennsylvania, Allegheny River, Monongahela River, Waste treatment, Monitoring.

Results of a study of the waste water discharges by a United States Steel Corporation (USSC) plant are summarized. Homestead Works occupies three separate areas: the Carrie Furnace area and the Main Homestead areas are on the Monongahela River upstream of the confluence of the Ohio, Monongahela, and Allegheny Rivers; The Wheel and Axle Works is located on the Ohio River at Mc Kees Rocks, Pennsylvania. Waste waters are discharged from the Mc Kees Rocks plant through three outfalls, 018, 019 and 020, into the Graham Street storm sewer which empties into the Ohio River. Outfall 018 contained only cooling water from the axle forge, and flows ranged from 0.52 mgd to 0.99 mgd during the monitoring with an average of 0.72 mgd. Outfall 019 consisted of untreated cooling water from the power house and the effluent from the oil treatment plant, and flows ranged from 1.38 mgd to 1.71 mgd, averaging 1.62 mgd during monitoring. USSC proposed that TSS and oil/grease be monitored at 119 rather than 019, but since 019 contains flow from all waste sources in the wheel mill and power house it was decided that monitoring should remain at outfall 019. Flow from outfall 020, a non-permitted discharge containing quench water from the machine shop, averaged 2,300 gpd. TSS and oil/grease levels were insignificant during the monitoring. Grab samples from the storm sewer discharge to the Ohio River had low levels of organic compounds not found in USSC discharges. Treatment processes removed approximtely 95% of the influent grease/oil load and 38% of the influent TSS load. USSC methods of determining flows only measure flows from the waste oil treatment facility, all other flows are estimated. (Davison-IPA)
W79-02791

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES, UNITED STATES STEEL CORPORATION, DUQUESNE PLANT, PITTSBURGH, PENNSYLVANIA, FEBRUARY 26-MARCH 6, 1976.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 594, Price codes: A07 in paper copy, A01 in microfiche Report No EPA-330/2-76/024, May 1976. 144 p, 22 fig, 27 tab, 7 ref, 4 append.

Descriptors: *Industrial wastes, *Water pollution, *Monongahela River, *Pollutant identification, Outfall sewers, Water quality control, Oil, Oil wastes, Trace elements, Effluents, Cyanides, Zinc, Ammonia, Phenols, Sampling, Organic compounds, United States Steel Corporation, Duquesne Plant, Monongahela River, Pittsburgh, Pennsylvania, Waste treatment, Monitoring.

Results of a survey of waste water discharges to the Monongahela River from the United States Steel corporation's (USSC) Duquesne Plant are summarized. The Duquesne Plant, located on the west bank of the Monongahela river at Pittsburgh, Pennsylvania, is primarily an iron and steel production facility with some finishing operations. There are seven major outfalls, 011, 012, 013, 014, 015, 016, and 017, and four intermediate outfalls, 111, 211, 112, and 114, through which all wastes are discharged. Except for process wastes from the blast furnaces, BOF (basic oxygen furnace), primary mills and bar mills, all waste waters are untreated. Treatment facility evaluations included influent and effluent sampling to determine removal efficiencies. Blast furnace process waste waters, consisting of mostly venturi gas washer flows treated by gravity thickening, were discharged to outfall 111, averaged 6.4 mdg, and contained suspended solids, ammonia, phenolics, cyanide, iron, and zinc. Findings of the in plant monitoring for the other outfalls are discussed and monitoring

requirements for seven of the outfalls is presented. It is concluded that USSC monitoring procedures are not sufficient to characterize the waste water quality or determine daily loads because of the widely varying flow. (Davison-IPA)
W79-02793

A CHEMICAL AND BIOLOGICAL EVALUATION OF THREE MINE DRAINAGE TREATMENT PLANTS,
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5D.
W79-02794

DISPOSAL OF DILUTE PESTICIDE SOLUTIONS,
Environmental Protection Agency, Cincinnati, OH. Office of Solid Waste Management.
For primary bibliographic entry see Field 5E.
W79-02795

OWENS-CORNING FIBERGLASS CORPORATION WASTEWATER TREATMENT FACILITY, ANDERSON, SOUTH CAROLINA, TECHNICAL SUPPORT PROJECT MARCH-MAY 1973.
National Field Investigations Center-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W79-02796

EXPERIENCE WITH WASTE WATER ACID NEUTRALIZATION (ERFAHRUNGEN MIT ABWASSER-SAUREZNEUTRALISATION),
For primary bibliographic entry see Field 5D.
W79-02798

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, EDGAR THOMPSON PLANT, PITTSBURGH, PENNSYLVANIA, JULY 22-AUGUST 5, 1975.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 589, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA/330/2-75/011, December 1975. 76 p, 6 fig, 9 tab, 3 ref, 6 append.

Descriptors: *Industrial wastes, *Water pollution, *Monongahela River, *United States Steel Corporation, Water quality control, Water pollution, Water pollution sources, Effluents, Oil wastes, Outfall sewers, Phenols, Zinc, Metals, Cyanides, Monitoring, Sampling, Trace elements, Organic compounds, Pittsburgh, Pennsylvania.

Results of the National Enforcement Investigations Center (NEIC) survey of the waste water sources of United States Steel Corporation's (USSC) Edgar Thompson Plant at Pittsburgh, Pennsylvania are discussed. The Edgar Thompson Plant consists of a sintering plant, five blast furnaces (BF), two basic oxygen furnaces, a 44-inch slab mill, and an ingot mold facility. The Monongahela River supplies the facility with up to 210 mgd of water via two intake stations; a small portion of this water is treated. Waste water is discharged from five outfalls; 001, 002, 003, 004 and 010. All outfalls, except 001, discharge into the Monongahela River; outfall 001 discharges into Turtle Creek, a Monongahela tributary. Waste waters from the outfalls was monitored and samples taken were analyzed. A comparison of the loads discharged during the monitoring period with USSC proposed load limitations reveals that the proposed load limitation for oil and grease were exceeded during six of the seven day monitoring period, and the average daily load was 300% in excess of the proposed limitations. USSC monitored only the portion of the wastes through 002 which contained effluent from the No.1 and 2 BF thickener and cooling water from No. 1 BF and power station No. 2. Non-monitored discharge from this outfall contains ingot mold foundry settling basin effluent, BF No. 1 cooling water, and Stirling boiler house and No. 1 power station effluents. No. 1 power station waste water was not identified previously to EPA. (Davison-IPA)
W79-02801

WIND POWERED AERATION FOR REMOTE LOCATIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering; and Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
P. M. Schierholz, W. L. Somervell, Jr., W. Babcock, R. Hartel, and K. Watson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 304, Price codes: A04 in paper copy, A01 in microfiche. Progress Report No. NSF/RA-760238, April 1976. 74 p, 22 fig, 9 tab. AER 75-00833.

Descriptors: *Aeration, *Wind velocity, *Winterkilling, *Windmills, Air circulation, Climatology, Weather, Weather data, Aquatic life, Oxygenation, Fish, Sewage lagoons, Lakes, Design criteria, Water pollution.

The use of wind powered aerators for the prevention of winterkill was studied. Design criteria for a wind powered aerator stipulates that it be light, easily handled, simple to install, economic and durable. The wind powered aerators for this study were constructed from 'off-the-shelf' and other parts readily available. The windmills tested and their four remote installation sites are summarized. The site at Keenesburg, Colorado, a sewage lagoon, required special equipment. Although the aerator operated all winter, insufficient oxygen was delivered to the lagoon to make a discernable difference in dissolved oxygen, due to the mild winter. At Robber's Roost, a high plains lake, the aerator operated most of the winter where a large hole was kept open in the ice almost all winter; no winterkill was indicated. Wind data for Reagan Lake, a high mountan winterkill lake, show this location has insufficient winds to support a windmill most of the time, and it is suggested that this lake be abandoned. The aerator at Lost Lake, a high mountain winterkill lake, was an experimental design, and although there were numerous problems associated with it, it was operational during the critical period. Fishing here was better than in previous years. Data from the weather stations maintained at the windmill sites and installations at other Colorado locations have not yet been analyzed. (Davison-IPA)
W79-02802

HANDBOOK FOR PESTICIDE DISPOSAL BY COMMON CHEMICAL METHODS,
TRW Systems, Inc., Redondo Beach, CA.
For primary bibliographic entry see Field 5E.
W79-02806

INVENTORY OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS BY STATES AND ENVIRONMENTAL PROTECTION AGENCY REGIONS.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 630, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-520/9-74-017, July 1974. 91 p, 12 tab.

Descriptors: *Water supply, *Water quality standards, Statistics, *Data collections, Regions, States, Water analysis, Microbiology, Bacteriological data, Certification, Public health, Potable water.

Tabulated data reporting the 1974 certification status of water supply systems serving interstate carriers is presented. The systems are certified annually by Environmental Protection Agency (EPA) Regional Administrators on the basis of recommendations and data submitted by the states. Systems in acutal compliance with the standards are classified as approved. The five provisional classifications are: (1) provisionally approved, (Q), water quality standards are violated; (2) provisionally approved (B), bacteriological sampling requirements have not been met; (3) provisionally approved (F), deficiencies in the facilities reduce its dependability; (4) provisionally approved (O), significant deficiencies in the operation of the system; and (5) provisionally approved (N), available bacteriological data are more than 18 months old. The inventory table is arranged according to EPA regions and the status therin. (Davison-IPA)
W79-02808

RESIDUAL MANAGEMENT BY LAND DISPOSAL, PROCEEDINGS OF THE HAZARDOUS WASTE RESEARCH SYMPOSIUM.
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.
W79-02810

TASTE AND ODOR, MISSOURI RIVER, IOWA TRIBUTARIES AREA, IOWA-NEBRASKA, 1970.
Environmental Protection Agency, Kansas City, MO. Region VII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 669, Price codes: A05 in paper copy, A01 in microfiche. Interim Report, 1970. 83 p, 3 fig, 41 tab, 13 ref.

Descriptors: *Water quality, *Baseline studies, *Missouri River, *Omaha, Aquatic microbiology, Biochemical oxygen demand, Coliforms, Municipal wastes, Industrial wastes, Water analysis, Monitoring, River systems, Tributaries, River flow, Activated carbon, Phosphorous, Runoff, Water properties, Taste, Odor, Sampling.

Recurring taste and odor problems experienced by the Omaha waterworks which prompted the Omaha Metropolitan Utility District's request for assistance resulted in this investigation. Previous efforts by local, State, and Federal groups have failed to provide solutions to the problem. Eight sampling sites were selected, and fifteen sample runs at three day intervals were scheduld before and after the expected flush of taste and odor causing materials. The parameter groups selected for study were: baseline and physial parameters; taste and odor related parameters; and nutrient and organic load parameters. Since no sever-taste and odor problems developed during March 1970, some resources were diverted from the survey effort and not all the planned work was accomplished. However, the tributory water produced a noticable impact on the Missouri River at Omaha during the survey period. During the flush priod on the tributory, actinomycete colony counts of 11,000 and 12,000/milliliter were obtained. Higher neutral and weak acid fractions were found in the Missouri River at Omaha and in the Boyer River as opposed to the Missouri River at Yankston by chloroform extracts from activated carbon column samples. The phosphorous and Biochemical Oxygen Demand loads from municipal and industrial waste discharges in the Sioux City area during pre-runoff conditions were a significant part of the total load of these factors in the Missouri River at Omaha. Dissolved and suspended nutrient concentrations increased from pre-runoff to runoff flow levels. (Davison-IPA)
W79-02811

SEICHE STRUCTURE AND VERTICAL MIXING BELOW THE EPILIMNION IN SMALL LAKES,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-02813

FIELD ESTIMATES OF AQUATIC PLANT RESPIRATION AND ITS APPLICATION OF STREAM DISSOLVED OXYGEN BUDGETS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W79-02816

SOIL MORPHOLOGIC AND HYDRAULIC CHANGES ASSOCIATED WITH WASTEWATER IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
T. W. Simpson, and R. L. Cunningham.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-291 399, Price codes: A10 in paper copy, A01 in microfiche. Research Project Technical Completion Report, November, 1978. 201 p, 21 fig, 10 tab, 32 ref, 4 append. OWRT A-045-PA(1), 14-34-0001-8040.

Descriptors: *Waste water irrigation, *Return flow, *Soil physics, Soil structure, Moisture, Soils, Sinks, Water table, Soil temperature, Soil bacteria, Soil treatment, *Morphologic properties(Soils), Hydraulic properties, *Mottling, Flow channels, Soil color.

Fifteen topographically matched pit transects were examined in treatment areas. Detailed profile descriptions and sketches were prepared for each transect. The morphologic data were quantified using a relative morphology rating scale developed to show differences in morphologic properties that could be related to hydraulic properties that had been significantly altered due to wastewater irrigation. This total score was used to establish suitability levels for sites based on the scores from the relative profile rating scale. Potential longevity of the site for wastewater irrigation was estimated using the average annual percentage of decrease in the relative profile rating score for all treatments, assuming a linear rate of change. U.S. EPA (1975) guidelines were used to make decisions on suitability using morphologic criteria. Morphologic propertis such as mottling, soil structure and moist consistence have changed due to wastewater irrigation. The 118 and 231 cm per year treatment areas have been altered sufficiently so they are not suitable for irrigation. The 59 cm per year area was considered marginally suitable for continued wastewater irrigation. The soils of the wastewater irrigation site occurred in extremely complex patterns prior to irrigation because of landscape overturning due to sinkhole formation and filling. Most flow through soils appears to follow specialized flow channels. (Sisk-Penn State)
W79-02817

INSTITUTIONAL ARRANGEMENTS FOR AREA-WIDE QUALITY PLANNING AND MANAGEMENT, SECTION 208 APPLIED IN THREE METROPOLITAN AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
P. C. Metzger, C. B. Alter, and J. W. Bulkley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 433, Price codes: A05 in paper copy, A01 in microfiche. Institute of Water Research, Michigan State University, East Lansing, Project Completion Report, Jan 1979, 98 p. OWRT A-096-MICH(1), 14-34-0001-8091.

Descriptors: *Area-wide water quality planning, *208 plans, *Institutional aspects, *Management, *Planning, Cities, *Water quality control, *Regional analysis, Legal aspects, *Metropolitan Areas of the Great Lakes, Detroit, Chicago, Cleveland.

The Section 208 legal framework for area-wide water quality planning has been reviewed. Management and control issues of area-wide water quality planning are identified as well as constitutional considerations and conflicts in multi-tier government program administration. 208 plans and processes in three metropolitan areas of the Great Lakes are reviewed. The legal framework section is applied in terms of the fulfillment of management structure requirements for the Detroit 208 area, Chicago 208 area, and the Cleveland 208 area. Variations in the formulation of institutional structures for the 208 areas are noted. The different roles of the several states in the development of the 208 plans are identified. Resistance to institutional change is identified as an important constraint impacting upon 208 management structure. Institutional factors are identified as the primary elements acting to limit the applicability in this country of the English and Welsh model of the Regional Water Authority. The proposa by U.S. EPA for implementing water quality programs through a new contractual devise between EPA and each of the states is presented. Lack of information upon this proposal precludes any conclusion as to whether or not the statutorily mandated function of water quality planning and implementation on a regional basis will in fact be maintained.
W79-02819

PROBABILISTIC ANALYSIS OF WATER AVAILABILITY IN POWER PLANT SITE SELECTION,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 3E.
W79-02834

HOST SPECIFICITY OF CERCOSPORA RODMANII, A POTENTIAL BIOLOGICAL CONTROL OF WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 4A.
W79-02884

CONTROL OF MERCURY POLLUTION,
Georgia Univ., Athens, Dept. of Food Science.
O. R. Noyes, M. K. Hamdy, and L. A. Muse.
Journal of Toxicology and Environmental Health, Vol. 1, p 409-420, 1976. 3 fig, 2 tab, 18 ref. OWRT B-069-GA(2), 14-31-0001-3870.

Descriptors: *Mercury, Rubber, Plastics, Adsorption, Water pollution control, Absorption, Mercury removal.

When a 203Hg(NO3)2 solution was kept in glass or polypropylene containers, different fractions of the radioactivity were absorbed on the container walls depending upon the chemical solution being used. The following factors affecting the removal of mercurials from aqueous solution stored in glass were examined: type and concentration of absorbent (fiber glass and rubber powder); pH; pretreatment of the rubber; and the form of mercury used. Rubber was equally effective in the adsorption of organic and inorganic mercury. The pH of the aqueous 203Hg2 + solution was not a critical factor in the rate of adsorption of mercury by the rubber. In addition, the effect of soaking the rubber in water for 18 hr. did not show any statistical difference when compared with nontreated rubber. It can be concluded that rubber is a very effective adsorbent of mercury, and thus, can be used as a simple method for control of mercury pollution.
W79-02885

RAPID METHOD FOR DETERMINING CONCENTRATIONS OF BAYER 73 IN WATER DURING LAMPRICIDE TREATMENTS,
Fish and Wildlife Service, La Crosse, WI. Fish Control Labs.
For primary bibliographic entry see Field 5A.
W79-02891

THE WHITE AMUR AS A BIOLOGICAL CONTROL AGENT OF AQUATIC WEEDS IN THE PANAMA CANAL,
Panama Canal Co., Balboa Heights, Canal Zone.
P. E. Custer, F. D. Halverson, J. Malone, and C. V. Chong.
Fisheries, Vol. 3(5), Sept.-Oct. 1978, p 2-9, 6 fig.

Descriptors: Aquiculture, Algae, *Canal zone, Aquatic plants, Aquatic weed control, *Aquatic weed control, Herbivores, Water temperature, Herbicides, Biological treatment, Arkansas, Macrophytes, Methodology, Dissolved oxygen, Fish transport, Laboratory tests, *Biocontrol, *White amur, Acclimation, *Panama Canal Zone, Gatun Lake.

The Panama Canal has been plagued with both floating and submerged aquatic weeds since its opening. Although more and more money has been spent on herbicides over the years, the weed problem has become more intense. In February 1978 the Panama Canal Company introduced the white amur as a biological tool to control the submerged macrophyte hydrilla to Gatun Lake, the large freshwater reservoir through which the majority of the length of the Canal passes. The first shipment of fish (125,000) did not successfully withstand the rapid change from cold Arkansas water temperatures to the warm tropical waters, with a resultant loss of about 50 percent. A tempering facility to acclimate a second fish shipment was constructed that circulated chilled lake water through a large fish-holding tank for a period of two days, during which time the temperature was gradually elevated and salt and disinfectants were added to the water. After tempering, the fish were successfully implanted in isolated arms of the lake, a helicopter being used for transportation. (EIS-Katz)
W79-02892

AN APPRAISAL OF THE HYDROGEOLOGICAL PROCESSES INVOLVED IN SHALLOW SUBSURFACE RADIOACTIVE WASTE MANAGEMENT IN CANADIAN TERRAIN,
Department of Fisheries and Environment, Ottawa (Ontario). Water Resources Branch
For primary bibliographic entry see Field 5B.
W79-02926

MANAGING OIL AND GAS ACTIVITIES IN COASTAL ENVIRONMENTS,
Fish and Wildlife Service, Washington, DC.
W. L. Longley, R. Jackson, and B. Snyder.
Biological Services Program. Report FWS/OBS-78/54. 1978. 66 p.

Descriptors: *Wetlands, *Environmental effects, *Oil industry, Salt marshes, Coastal marshes, Marshes, Ecosystems, Marsh plants, Oil, Oil fields, Drilling, Oil wastes.

General information is presented on the environmental effects on petroleum development activities upon coastal wetlands. Part One consists of brief descriptions of several types of coastal ecosystems, grouped into three categories: uplands, seasonally flooded wetlands, and saturated wetlands and open water. Characteristic vegetation, animals, water regimes, and management practices are included. Part Two deals with the impacts of petroleum development activities, ranging from pre-exploration surveys through termination of production. Depending upon the category of ecosystem involved, the execution of some of the petroleum development activity varies. In addition to describing the activity and its impacts, this chapter contains comments and suggestions that can help to mitigate the effects of each activity. (Steiner-Mass)
W79-02931

REEDS CONTROL EUTROPHICATION OF BALATON LAKE,
Research Inst. for Water Resources Development, Budapest (Hungary).
L. Toth.
Water Research, Vol. 6, p 1533-1539, 1972. 3 fig, 3 tab, 13 ref.

Descriptors: *Marsh plants, *Sewage effluents, *Water purification, Wetlands, Fresh water marshes, Marshes, Sewage disposal, Waste water(Artificial), Nutrients, Biological treatment, Water quality, Lakes.

The effect of effluents from sewage purification plants passing directly into Lake Balaton, Hungary was compared with the effect produced in passing the effluent through a reed wetland first. The phosphorus and nitrogen content of the effluent is utilized by the ha organisms on the reeds in the period of low load in July and during the maximum load in August, and hardly detectable amounts of nitrogen and phosphorus get into the open water of the lake. With regard to lake protection, two conflicting observations were made. The lake is said to be protected by the reeds only

during one season, as in the autumn when the reeds die down the materials retained by them are mixed with lake water by wave-action; on the other hand, the food materials discharged into the reeds and stabilized in the bodies of the living organisms there which are either eaten by fish or leave the water for dry land, might decrease the trophic grade of the lake. (Steiner-Mass)
W79-02954

HATCHERY ALARM SYSTEM TO PROTECT AGAINST CATASTROPHIC EGG OF FISH KILLS,
National Fish Hatchery White Sulphur Springs, WV.
P. A. Stine.
The Progressive Fish Culturist Vol. 40(4), p 167-168, Oct. 1978. 1 fig.

Descriptors: *Aquiculture *Fish hatchery, *Dissolved oxygen, *Fish kills, Fish eggs, Mortalities, Monitoring, Laboratory equipment, Methodology, Dissolved oxygen monitoring, *Hatchery alarm systems, Water level.

A system is described for use in fish rearing establishments to monitor both dissolved oxygen and water levels. (EIS-Katz)
W79-02977

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

IDENTIFICATION AND INITIAL EVALUATION OF IRRIGATION RETURN FLOW MODELS,
Irrigation Hydrology Co., Fort Collins, CO.
W. R. Walker.
Publication No. EPA-600/2-78-144, July, 1978. 124 p, 3 fig, 4 tab, 160 ref, 6 append.

Descriptors: *Return flow, *Mathematical models, Irrigation, Water resources, Water pollution, Water, Simulation analysis, Water quality, Soil water, Soil chemistry, Evapotranspiration.

A broad based literature review was undertaken to identify studies that had yielded digital computer models applicable to irrigation return flow (IRF) systems. The programs not listed in technical reports or papers were requested from the various authors. The resuls of this work are 43 computer models applicable all or in part to the analysis of IRF's and their quality. A brief evaluation of each model is given. IRF modeling technology is well developed theoretically but not completely verified due to the large scale of the irrigation system. Most models remain in the research sphere and need to be redefined for the wider utilization of planners. Field data are generally not available to satisfy the input requirement of most IRF models. Accuracies of predictions need to be determined against standarized conditions in order to further model development and parameter sensitivities should be investigated to isolate the most important field data. (Skogerboe-Colorado State)
W79-02510

A PROCEDURE TO DETERMINE DIRECT DIVERSIONS FROM LAKE MICHIGAN,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 3D.
W79-02523

ENVIRONMENTAL IMPACT ASSESSMENT.
Lyndon B. Johnson School of Public Affairs, Austin, TX.
For primary bibliographic entry see Field 6G.
W79-02524

SUBJECTIVE DETECTION OF DIFFERENCES IN VARIANCE FROM SMALL SAMPLES,
Arizona Univ., Tucson. Dept. of Civil Engineering.
R. L. Fike, and W. R. Ferrell.
In: Proceedings American Institute for Decision Sciences, Sixth Annual Meeting, Western Regional Conference, Phoenix, March 17-18, 1977. 5 p, 7 fig, 3 tab, 13 ref, Append.

Descriptors: *Model studies, *Performance, Optimization, Social perception, *Signal detection theory.

Experiments are reported testing people's ability to detect differences in population variance from small samples. The model adopted is that of signal detection theory (SDT), yielding measures of sensitivity that are independent of the response criterion and that can be compared with optimal performance. The results were consistent with SDT. Contrary to expectation, the best performance was very nearly optimal under every condition. Making the mode of presentation more abstract--from visually perceived dispersion of points on a line to numbers to letters to verbal categories--did not signficantly affect the high level of relative performance.
W79-02597

RESOURCE DEMANDS FOR ENERGY DEVELOPMENT IN THE YELLOWSTONE RIVER BASIN,
CH2M/Hill, Sacramento, CA.; and North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 6D.
W79-02726

AN ECONOMIC ANALYSIS OF ALTERNATIVE FEDERAL FLOOD DAMAGE ASSISTANCE PROGRAMS.
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 6F.
W79-02824

SYSTEMATIC ASSESSMENT OF UNCERTAINTIES IN AN ENVIRONMENT IMPACT STATEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W79-02882

6B. Evaluation Process

ENVIRONMENTAL ASSESSMENT - ALTERNATIVES OF GENERAL MANAGEMENT PLAN AND WILDERNESS STUDY FOR CAPE LOOKOUT NATIONAL SEASHORE, NORTH CAROLINA.
National Park Service, Denver, CO. Denver Service Center.
For primary bibliographic entry see Field 6G.
W79-02525

SUBJECTIVE DETECTION OF DIFFERENCES IN VARIANCE FROM SMALL SAMPLES,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-02597

AQUATIC RESOURCES AND RECREATION BEHAVIOR,
Texas Agricultural Experiment Station, College Station. Dept. of Recreation and Parks.
N. H. Cheek, Jr., and D. R. Field.
Leisure Sciences, Vol. 1, No. 1, p 67-83, 1977, 7 tab, 9 ref. OWRT A-047-WASH(5).

Descriptors: *Resource base, *Aquatic environment, *Recreation, Recreation participation, Activity clusters, Recreation facilities, Sociology, Social participation.

While substantial effort has been undertaken to understand the consequences of industrial and agricultural uses for the environment, concern has also been expressed about its other uses, including recreation. Little is known about the relationship between recreational behavior and an environmental resource base. This paper focuses upon participation in a specific outdoor recreation activity or activity-cluster and dominant resource base where participation occurs. Resource bases identified were river, lake, ocean, swamp/marsh, forest/mountain, range/farm and city/town. Emphasis is placed upon aquatic environs and participation in water-based recreation. Water activities constituted from 14-30 percent of all outdoor activities taking place at those resource bases identified. Aquatic environments provided the resource base for 38 percent of all recreation participation events, water- and non-water based, occurring during one reporting period. While participation in water-based activities requires a water resource, the array of participation patterns reported suggests that resource bases defined as recreation places provide a wide range of opportunities for non-resource-dependent recreation activities. One conclusion is that resource bases cannot be distinguished by the recreation activities occurring on them. Resource bases in fact facilitate a wide range of recreation activities, some holding little direct connection with the resource base, nor are the conditions of the resource sufficient to predict behavioral outcomes.
W79-02641

A PROGRAM TO PROMOTE IRRIGATION CONSERVATION IN IDAHO,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 3F.
W79-02671

OPTIMIZING IRRIGATION SYSTEM DESIGN,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 3F.
W79-02672

SOCIAL OVERHEAD CAPITAL COSTS OF IRRIGATION DEVELOPMENT IN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W79-02719

LINEAR PROGRAMMING MODEL TO QUANTIFY ECONOMIC, ENVIRONMENTAL AND SOCIAL VALUES OF A TIDAL MARSH,
Columbia Univ., New York. School of Engineering and Applied Science.
D. Hill.
PhD Dissertation, 1977. 107 p.

Descriptors: *Salt marshes, *Appraisals, *Value, *Economic efficiency, Wetlands, Tidal marshes, Coastal marshes, Evaluation, Cost analysis, Model studies, Social values, Marsh plants.

The formulation of a resource allocation model provides a structure in which economic, scientific, and political considerations are given a place in setting a dollar value on salt marsh. To illustrate the method, data are drawn from the literature of a number of Atlantic Coast marshes to describe a hypothetical composite bay. Typical uses of an estuary are comprised in a linear programming model which is initially solved to determine the mix that maximizes their dollar value. The value of a marginal acre of marsh grass under these circumstances is given by its shadow price. This varies according to its effectiveness in nutrient removal and its production of detritus. To show the effect of the unquantifiable values of the natural salt marsh, its market price is then increased parametrically to determine alternative resource allocations in which a larger amount of the salt marsh is preserved. As indicated by the shadow price in each case, the additional value of unquantified environmental and social effects must break even with the opportunity cost of providing them. The cost increase of each alternative can then be weighed by the decision maker in judging the

desirability of preserving more acreage of salt marsh. (Steiner-Mass)
W79-02723

NEW CONSIDERATIONS FOR MUNICIPAL WATER SYSTEM PLANNING,
Montgomery (James M.)
R. H. Ellis.
Water Resources Bulletin, Vol. 14, No. 3, p 542-553, June 1978. 3 fig, 6 ref.

Descriptors: *Municipal water, *Planning, *Effects, Waste water (Pollution), Reclamation, Water reuse, Water conservation, Financial constraints, Public attitudes, Environmental concerns, Enegy utilization, Safe Drinking Water Act, Coordintion.

The primary objectives are to identify new considerations which should be incorporated into the planning of municipal water systems, and to assess the potential effects of these new considerations on traditional planning concepts. Generally, master water plans include analyses of supply and demand, descriptions of existing facilities, and proposed construction programs. Although many master water plans do consider the potential effects of future conditions, recent advances in technology and changing social concerns are beginning to exert a significant influence on the future course of water system development. Some of the new considerations which should be incorporated into municipal water system planning include the Safe Drinking Water Act, coordination with wastewater planning, wastewater reclamation and reuse, water conservation, environmental concerns, energy utilization, financial constraints, and changing public attitudes. In order to provide a responsive and effective framework for future planning of municipal water systems, the influence of these new considerations must be carefully evaluated in conjunction with traditional planning concerns. (Bell-Cornell)
W79-02729

FACTUAL INPUTS FOR ALLOCATION DECISIONS CONCERNING SCARCE WATER RESOURCES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
L. Icerman.
Water Resources Bulletin, Vol. 14, No. 3, p 651-662, June 1978. 12 tab, 17 ref

Descriptors: *Industrial water, *Water utilization, *Water allocation(Policy), *Water resources, *Scarce water, Decision making, Water consumption, Patterns, Consumptive use, Crop production, Irrigation, Energy development, Assessment, California.

Factual inputs which may be useful for completing first-order assessments to aid decision making on the allocation of scarce water resources are compiled. Water needs of major manufacturing industry groups and of minerals industries show wide variations in serveral measures of water use intensity. The chemicals and allied products and primary metals industries dominate the total water intake and consumptive water use by manufacturing industries. Consumptive use per employee for the petroleum and coal products industry groups in nearly 2.5 times higher than that for any other industry group. Estimates of the water requirements per unit energy output for energy-processing systems vary by as much as an order of magnitude. Agricultural water use is large than that of any other industry but water use for irrigation is not expected to increase significantly by the year 2020. In California, the production of crop calories and proteins per unit of irrigation water applied may vary by more than an order of magnitude. Crops which offer larger monetary returns per acre are irrigated most frequently. (Bell-Cornell).
W79-02731

VALUES AND CHOICES IN THE DEVELOPMENT OF THE COLORADO RIVER BASIN.
American Association for the Advancement of Science, Washington, DC. Committee on Arid Lands.
University of Arizona Press, Tucson, 1978. 337 p. Peterson, D.F. and Crawford, A.B., eds. $7.50.

Descriptors: *River basin development, *Colorado River Basin, *Resources development, *Water utilization, Arid lands, Land use, Energy conversion, Regional analysis.

The framework for the presentations in this book, divided into 'historical perspectives' and 'future directions', derives from a AAAS symposium sponsored by the Association's Committee on Arid Lands, San Francisco, 1974. As the arid southwest continues developing and changing, the Colorado River Basin and its vast hydrocarbon fuel resources will increasingly be the subject of study. While the Basin's mineral, agricultural, grazing, recreational, wilderness and archaeological resources will come under scrutiny, the River itself remains the dominant value of the region. The use of all the Basin's resources requires a readily available source of water which is, in this case, already completely used or in a transitional stage of use. While the Colorado may be unique in many ways, it is also typical of other arid region river basins experiencing increasing demands and transitional forces. Discussed here are the general characteristics of the Basin that qualify it as a proper representative of arid zones undergoing similar transitional processes throughout the world. (Tickes-Arizona)
W79-02732

PHYSICAL SETTING, (COLORADO RIVER BASIN),
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 4A.
W79-02733

COLORADO RIVER DEVELOPMENT, (COLORADO RIVER BASIN),
Upper Colorado River Commission, Salt Lake City, UT.
For primary bibliographic entry see Field 6E.
W79-02734

POLITICS OF WATER ALLOCATION, (COLORADO RIVER BASIN),
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6E.
W79-02735

POLICY GOALS AND VALUES IN HISTORICAL PERSPECTIVE, (COLORADO RIVER BASIN),
Colorado State Univ., Ft. Collins.
H. P. Caulfied, Jr.
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p 113-120, 1978. University of Arizona Press, Tucson. 5 ref.

Descriptors: *Colorado River basin, *River basin development, *History, *Social values, *Sustained yield, Natural resources, Water yield improvement, Planning, Political aspects, Institutions.

Development of water and related land policies in river basins of the arid U.S. west are documented here, from the land boom and growing emphasis on irrigation works between 1870-1880, to the present, showing the influence of changing social values. Public values and policies relating to the Colorado River Basin's natural resources can be divided into two periods, the progressive thrust and the period of conservation/preservation thrust. The former, based on the value of individualism embodied in the Carey (1894), Homestead (1862), and townsite (1906) acts, was characterized by anti-monopoly activities and manifestations of egalitarianism. The conservation/preservation thrust, emboidied by forces led by Pinchot since the turn of the century, is based on the development and wise usage of these resources. These policies, reflecting the development movement in America, have been based on the sustained yield concept. This author applies these values and related policy thrusts to the Colorado River Basin specifically, showing how the progressive thrust, for instance, has been manifest in the excess land laws based on the family concept of low-cost power. Conservation interests have been evident by r and d of sustained yield techniques of water and land resources by the Bureau of Land Management, land grant college programs, the USDA. Historic fluctuations of control and alliance between these two approaches is documented to the present, with this author concluding that it is the strength of political coalition that will determine the effectiveness of present and future policy. (See also W79-02732). (Thickes-Arizona).
W79-02736

ENERGY RESOURCES DEVELOPMENT, (COLORADO RIVER BASIN),
Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 3E.
W79-02737

THE ROLE OF AGRICULTURE, (COLORADO RIVER BASIN),
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 3F.
W79-02738

RECREATION, (COLORADO RIVER BASIN),
Utah State Univ., Logan.
L. E. Royer, and J. D. Hunt.
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p 173-193. University of Arizona Press, Tucson, 1978. 4 fig, 23 ref.

Descriptors: *Recreation, *Colorado River Basin, *River basin development, *Impoundments, *Recreation demand, Recreation facilities, Project planning, Decision making, Water management(Applied), Multiple-purpose.

Because of the lack of heterogeneity in the Colorado River Basin, these authors have rejected the theory that the Basin as a whole can be considered prototypic of the recreational opportunities in arid lands generally. What requires our attention, they believe, is the role of water, not in the sense of rainfall or climate conditions but the institutional organization of the region, its geopolitical arrangements, and the cultural perceptions of the Colorado River itself. They point out that the management of the flow of water in the river has diminished recreational choices and will narrow further choices in future. If recreation in the drainage basin is to be developed as one of the outputs of multiple-purpose water development, the recreation opportunity spectrum is fixed by the technological capability of large-scale water impoundment, which in turn is dependent on the magnification of benefits. Several examples are given, however, which indicate an erosion of recreational opportunities and resources in the basin based on political decisions of water choice rather than recreational choice that limit and structure recreational futures of the basin. Perceptions based on such water-dependent economic development as the Salt River Project's Navajo Power Plant on the shore of Lake Powell, the use of strip-mined coal from the Black Mesa Mine, and the intrusion of transmission lines into the Paria Canyon Primitive Area, support the contention that this wider continuum of water management strategies has not enhanced the recreation future of the central portion of the Colorado River Basin. (See also W79-02732). (Paylore-Arizona).
W79-02739

COMMUNITY DEVELOPMENT, (COLORADO RIVER BASIN),
California Univ., Santa Barbara.
D. E. Mann
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p 195-219. University of Arizona Press, Tucson, 1978. 2 tab, 25 ref.

Descriptors: *Community development, *Colorado River Basin, *Southwest U.S., *Urban sociology, Decision making, Rural sociology, Social aspects, Project planning, Economic justification, River basin development, Regional analysis, Regional economics.

Development of urban and rural communities in the Southwest U.S. as described here is based on available general information as well as on data supplied to the author directly by the cities themselves. The diverse nature of such a large area makes a simple analysis difficult and complex, and this study accordingly opts for a discussion of the Southwest US rather than being obliged to observe the hydrological boundaries of the Colorado River Basin. The primary role of the public decision process in determining the environmental character of each sub-region is emphasized in an analysis of population trends in urban and rural areas of Arizona, New Mexico, Colorado, Utah, and California. Community development plans as discussed here are not derived through market forces but rather through individual perception and choice, which may explain in part the significant lack of focus on the role of a diminishing water supply on many community development projects in the arid southwest: people do not 'choose' to acknowledge the area's water realities. Development plans and processes in Albuquerque, New Mexico, Tucson, Arizona, and Farmington, New Mexico, and Pioche, Nevada are presented in an effort to illustrate the manner in which development choices are perceived and carried out. (See also W79-02732). (Tickes-Arizona).
W79-02740

CARRYING CAPACITY AND PLANNING, (COLORADO RIVER BASIN),
Utah State Univ., Logan.
A. B. Crawford, and A. B. Bishop.
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p. 292-313. University of Arizona Press, Tucson, 1978. 8 figs, 2 tabs, 2 refs.

Descriptors: *Carrying capacity, *Colorado River Basin, *Regional analysis, *Planning, *Human resources.

For its size, the Colorado River is probably the most utilized, controlled, and fought over river in the world, as these authors point out in an analysis of how the carrying capacity of the Basin's resources may be a key factor in choices about the region's future growth and development. On the basis of their analysis of the carrying capacity concept, they set forth the parameters of carrying-capacity based planning: identification of driving forces and examinations of the effects of such forces on carrying capacity as well as formulations and implementation of strategies for managing change. They then take up carrying capacity-based planning issues as they relate specifically to the Colorado River Basin: agriculture, environmental quality, and water supply. Their overall posture in defining carrying capacity concepts is a broad one that includes the interactions that occur between human and natural systems, rather than the narrow one that relates to particular aspects such as maximum sustained yield, for instance. In summary, they maintain that the development of carrying capacity concepts can help extend the usefulness of these indicators into the realm of making comparative evaluations of environmental quality dimensions in terms of ranges and limits of acceptable levels, and the impact of various regional growth policies. (See also W79-02732) (Paylore-Arizona)
W79-02741

INSTITUTIONAL ARRANGEMENTS FOR AREA-WIDE QUALITY PLANNING AND MANAGEMENT, SECTION 208 APPLIED IN THREE METROPOLITAN AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-02819

ISSUES, INTERESTS AND POWER: ENVIRONMENTAL POLITICS IN THE COMMUNITY SETTING,
Delaware Univ., Newark.
T. A. Leitko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 338, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Dissertation, June 1977. 190 p, 32 tab, 143 ref, 2 append. OWRT A-031-DEL(1).

Descriptors: *Social aspects, *Political aspects, Delaware, Ohio, *Institutions, Michigan, *Attitudes, *Community development, Water supply, Water pollution, *Social values, Environment, Flood control, *Local governments.

The purpose is to analyze the extent and direction of mobilization of local communities for the solution to water-related problems. Community is defined as a public institution established for actualizing life-style values for the interest groups dominant in the locality. Environmental factors become issues or non-issues as they enter into the local goal setting process. It is hypothesized that water supply is more likely to be perceived as a salient problem in growth oriented communities because it is a precondition for industrial growth and population expansion. Water pollution and flooding are more likely to be perceived as salient problems where residential interests are well organized. Data for this study are from interviews with 160 community leaders (89.3% of the population) in 12 small communities; six in Delaware, four in Ohio and two in Michigan. Findings indicate that political mobilization and growth orientation are higher in verticaly integrated communities. Also, community leaders respond to the surfacing of pollution problems with increasing inactivity and local solvability, and supply problems with decreasing inactivity and increasing local solvability. This indicates that where community leaders implement nondecision making for pollution problems, they implement solutions to supply problems. In both cases they attempt to avoid ties with extralocal agencies.
W79-02825

EFFECTS OF WATER DRAWDOWN ON THE FAUNA IN SMALL COLD-WATER RESERVOIRS,
Colorado Univ., Ft. Collins.
For primary bibliographic entry see Field 4A.
W79-02830

PROBABILISTIC ANALYSIS OF WATER AVAILABILITY IN POWER PLANT SITE SELECTION,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 3E.
W79-02834

SOCIAL IMPACTS FROM WILDLIFE WITHIN THE COLUMBIA BASIN IRRIGATION DISTRICT,
Washington State Univ., Pullman. Dept. of Forest and Range Management.
J. A. Rajala.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 339, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, 1979, 107 p, 4 fig, 29 tab, 57 ref, 2 append. OWRT C-7165(No 6213)(2), 14-31-0001-6213.

Descriptors: *Social impacts, Irrigation projects, Planning, Economic impacts, Fish, *Wildlife, *Recreation, *Washington, Management, *Columbia River Basin, *Irrigation districts, *Attitudes, *Social values.

Social impacts to landowners and recreationists from wildlife in the Columbia Basin Irrigation Project were identified through interviews and a questionnaire. Demographic characteristics and other background information of landowners and recreationiests were statistically compared with their evaluation of the social impacts. Both landowner's and recreationists' appreciation for wildlife was rated on an index of six statements reflecting concern for the welfare of wildlife. All nine of the negative social impacts with which landowners agreed were directly or indirectly related to recreationists. They did not feel they should have to manage recreationists as part of being a private land manager. Landowners disagreed with suggested negative impacts from wildlife but felt that the most important positive impacts came from having wildlife on their property and that wildlife contributed to the quality of life in the Columbia Basin. Recreationists agreed with statements reflecting negative social impacts caused by recreationists, such as litter, inconsideration towards landowners, and respect of the landowner's right to control access to his property. Recreationists disagreed with the statement reflecting fear of possible danger from wildlife. The abundance of wildlife was an important consideration in participation by 94 percent of the recreationists. Recreationists agreed with five of the seven suggested elements of satisfaction associated with abundance of wildlife. Recreationists had significantly more appreciation for wildlife on the index than did landowners. Implications for management include promoting proper conduct by recreationists, continuing programs to gain public access to wildlife on private land, promoting wildlife management by private landowners, and providing sufficient numbers of wildlife to maintain the interest of the recreationist and allow for the harvest of diverse satisfactions from the experience. (McKenzie-Washington)
W79-02839

A MULTIOBJECTIVE APPROACH TO MANAGING A SOUTHERN ARIZONA WATERSHED,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4D.
W79-02881

6D. Water Demand

INTERIM REPORT OF THE GOVERNOR'S TASK FORCE ON WATER RESOURCES.
Kansas Water Resources Board, Topeka.
December 1977 83 p, 3 fig, 6 tab, 8 photo, 4 append.

Descriptors: *Kansas, *Water resources, *State governments, Water supply, Governments, Groundwater, Groundwater resources, Water resources development, Water quality, Surface waters, Environment.

The Governor's Task Force on Water Resources was charged with: (1) determining the key problems of water supply facing Kansas now and in the future; (2) examining the causes underlying these water supply problems; and (3) identifying options available to the state and local units of government for resolving such problems. This was essentially a progress report which provided some much needed background information on the groundwater resources of Kansas, an overview of the State's water management structure, an identification of management alternatives, and an outline of next year's study plan. Recommendations came from Subcommittees on Groundwater Management and Program Coordination, indicating the priority and attention the Task Force has given to the declining groundwater tables in Western Kansas and the splintered management of the State's eighty water resource programs. The two most significant concepts reflected in the listed recommendations were (1) the confirmation and reaffirmation that the responsibility for managing the State's groundwater resources should remain with local units of government, and (2) the leadership in coordinating the funding of the State's water resources programs should be a specific responsibility of the Kansas Water Resources Board. (Froehlich-ISWS)
W79-02700

RESOURCE DEMANDS FOR ENERGY DEVELOPMENT IN THE YELLOWSTONE RIVER BASIN,
CH2M/Hill, Sacramento, CA.; and North Dakota State Univ., Fargo.
J. W. Knapp, and F. L. Leistritz.
Water Resources Bulletin, Vol. 14, No. 3, p 613-628, June 1978. 1 fig, 3 tab, 10 ref.

Descriptors: *Methodology, *Regional analysis, *Water demand, *Planning, *Energy, *Yellowstone River Basin, Economics, Forecasting, Water resources, Energy development, Analytical techniques, Mathematical models, Demand, Schedule, Systems analysis.

Reported is the development of a mathematical model for forecasting energy development in the Yellowstone study area for the years 1985 and 2000, and for determining the associated demands for water, land, labor, capital, and mineral resouces. The study was prepared for use by the Missouri River Basin Commission in conducting a comprehensive 'Level B' planning study of the wate and related land resources in the Yellowstone River Basin. The study results indicate that the amount of coal development in the study area will depend primarily upon state and federal energy policies and regulations. Policies related to slurry pipeline transportation of coal will be particularly important in determining the level and pattern of future energy development in the area. Coal production under the 'most probable' scenario is expected to increase from about 40 million tons in 1976 to 163 million tons per year by 1985, and 513 million tons in the year 2000. Consumptive water use for energy development in the study area could be as much as 556,000 acre-feet per year by the year 2000 (under the high scenario). A parametric analysis was conducted on the 1985 most proble scenario to determine the influence on the study results of variations in the delivered price of water. Water requirements were reduced by nearly one-fourth as water costs increased from zero to over $750 per acre-foot (Bell-Cornell)
W79-02726

VALUES AND CHOICES IN THE DEVELOPMENT OF THE COLORADO RIVER BASIN.
American Association for the Advancement of Science, Washington, DC. Committee on Arid Lands.
For primary bibliographic entry see Field 6B
W79-02732

PHYSICAL SETTING, (COLORADO RIVER BASIN),
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 4A.
W79-02733

RECREATION, (COLORADO RIVER BASIN),
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W79-02739

6E. Water Law and Institutions

LAWS PASSED DURING THE 1976 SESSION OF THE MISSISSIPPI LEGISLATURE (CONCERNING MAINE AND COASTAL ZONE),
Mississippi Univ. Law Center, University.
Available from Univ. of Miss. Law Center, Oxford, Miss., Mississippi-Alabama Sea Grant Consortium. Report MASGP 77-010, 1976. 23p.

Descriptors: *Mississippi, *Legislation, *Coasts, *Environmental control, Floods, Hunting, Waterflow, Solid waste disposal, Port authorities, Water supply, Groundwater, Regulation.

This volume represents those laws that were passed during the 1976 Session of the Mississippi Legislature that would affect the use and development of the state's marine and coastal zone. Certain chapters pertain to general administration. Chapter 341 authorizes counties and municipal and private companies to participate in applicable approved regional solid waste disposal and recovery systems. Chapter 404 provides for posting of land subject to flooding. Chapter 173 empowers municipalities to erect, purchase, operate, and regulate waterworks Chapter 474 empowers the Mississippi Board of Water Commissioners to delineate capacity use areas of the state where it finds that the use of groundwater requires coordination and limited regulation for the protection of the interests and rights of property owners or the public. Chapter 342 provides for the transportation of solid wastes across Mississippi state lines, establishes ownership of solid wastes, and further regulates disposition of solid wastes. Chapter 452 designates the State Board of Health as the Drink Water supply Regulatory Agency, and outlines the Board's responsibilities. There are also some hunting regulations in this volume. (Horwich-Florida)
W79-02526

UNITED STATES SEAWARD JURISDICTION-POST, PRESENT, AND FUTURE,
Mississippi Univ. Law Center, University.
Available from Univ. of Miss. Law Center, Oxford, Miss. Mississippi-Alabama Sea Grant Consortium. Report MASGP 77-011, 1976. 23p.

Descriptors: *Law of the sea, *International law, *Jurisdiction, *International waters, Water rights, Fishing, Federal government, Submerged lands act, Oceans, Analysis, United States.

Seaward jurisdiction is in a state of great change Even though international negotiations on the Law of the Sea appear to be stalemated, proclamations by coastal nations are changing traditional patterns of ocean use. This paper is an analysis of the jurisdictional zones and how the United States is extending its jurisdiction. The old three-mile territorial sea concept, although still officially recognized by most nations, is being whittled away as certain types of authority--such as exclusive fishing rights--are extended well beyond the three-mile limit. An example is the 1976 United States Fishery Conservation and Management Act. These changes are best understood by extensions of certain rights traditionally associated with the narrow territorial sea, which may be described not only by reference to physical boundaries, but also with reference to certain rights. Concepts such as 'contiguous zone,' 'fishing zone,' and 'exclusive economic control zone' are all extensions of functions of the coastal state in the territorial sea, and represent shrinkage of the freedom of the high seas. Pressures for extension of coastal state jurisdiction in the ocean have been almost entirely economic--prompted by the desire to control natural resources. (Horwich-Florida)
W79-02527

LAWS PASSED DURING THE 1975 SESSION OF THE MISSISSIPPI LEGISLATURE (CONCERNING MARINE AND COASTAL ZONE),
Mississippi Univ. Law Center, University
Available from Univ. of Miss. Law Center, Oxford, Miss., Mississippi-Alabama Sea Grant Consortium. Report MASGP 77-009, 1975. 50p.

Descriptors: *Mississippi, *Legislation, *Coasts, *Marine animals, Pesticides, Oil wastes, Waste disposal, Regulation, Environmental control, Oysters, Hunting, Forestry.

This volume represents those laws that were passed during the 1975 Session of the Mississippi Legislature that would affect the use and development of the state's marine and coastal zone. Chapter 318 provides for the use and application of restricted use pesticides and to provide for the certification of applicators. Chapter 496 provides for the financing and construction of areawide waste disposal systems. Chapter 321 amends a 1972 Act and furnishes the Mississippi Marine Conservation Commission with jurisdiction and authority over all marine aquatic life. Chapter 308 allows for orderly marketing and easy consumer identification in the retail marketplace of catfish products produced or processed in Mississippi. Chapter 342 deals with the administration and enforcement of state oil and gas conservation laws. The state Oil and Gas Board has the duty to make rules and regulations--subject to the approval of the Mississippi Air and Water Pollution Control Commission--controlling the disposal of waste products brought to the surface from any oil, gas, or condensate well, and preventing seepage, overflow, or any other type of irreparable damage to the topsoil or surface area. (Horwich-Florida)
W79-02528

ACREAGE LIMITATIONS ON BUREAU OF RECLAMATION PROJECTS,
Hearing, Subcomm. on Public Lands and Resources, Comm. on Energy and Natural Resources, U.S. Senate, August 11, 1977, Publication No. 95-67, 111 p.

Descriptors: *Irrigation water, *Water allocation(Policy), *Water demand, *Evaluation, Water policy, Water permits, Water law, Legal aspects, Water utilization, Water supply, Water districts, Legislation.

The Senate Subcommittee on Public Lands and Resources hearing on acreage limitations on federal Bureau of Reclamation projects included consideration of soil, climate, and farming difference methods which affect comparative productive potential of irrigable lands. Testimony of landowners and officials of irrigation districts indicated the present 160 acre limitation applicable to Bureau projects was unreasonable because it was too small for many farmers to make a living with. Senate Bill 242 would provide an equivalency formula under which the Secretary of the Interior would have the authority to change the acreage limitations. The legislation would not change the class 1 soil-type 160 acre limitation, but an individual would be eligible to receive water for quantities of class 2, 3 or 4 land equal to 160 acres of class 1 soil. The present reclamation law was passed in 1902 when most farms were small and primitive farm machinery was used. However, modern farming methods are more efficient and only larger farms are profitable. The 160 acre limitation should be updated to reflect modern reality. All testimony given before the subcommittee is included. (Rule-Florida)
W79-02529

CERTAIN WATER RIGHT CLAIMS OF THE AK-CHIN INDIAN COMMUNITY,
Hearing, Select Committee on Indian Affairs U.S. Senate, July 25, 1977. 50 p.

Descriptors: *Arizona, *Indian reservations, *Water rights, *Federal government, Irrigation programs, Water utilization, Legal aspects, Aquifer systems, Recharge, Agriculture, Groundwater resources, Water supply development.

This U.S. Senate Select Committee on Indian Affairs (Committee) hearing addresses Senate Bill 1582 which attempts to make available a temporary water supply for the Ak-Chin Indian Community (Indians) in central Arizona, until a permanent supply can be developed. The bill provides that the Indians would waive all claims against the U.S. for the government's past failures as trustee to assert and protect the Indian's water rights--thereby avoiding costly litigation. The Indians have gone from abject poverty to self-sufficiency as a result of the farming of reservation land. The federal government has failed to supply the Indians with their 'Winter's' rights water. To survive, the tribe must pump water from the aquifer at increasing costs. This is causing the aquifer to drop 20-feet per year, resulting in a buckling of reservation lands. The Committee is addressed by a representative of the federal Department of the Interior and Resource Planning Officers from the Bureau of Reclamation. They suggest that a feasibility study of the potential water supply and development costs be undertaken prior to the bill's passage. The bill's authors respond to this suggestion stating the need for immediate action. All testimony given before the Committee, as well as maps and graphs are included. (Goldberg-Florida)
W79-02530

WATER RESEARCH AND DEVELOPMENT (BILLS TO AMEND THE WATER RESOURCES PLANNING ACT AND PROMOTE MORE RESPONSIVE NATIONAL WATER RESEARCH PROGRAM).
Hearing, Subcomm. on Water Resources of the Committee on Environment & Public Works, U.S. Senate, April 7, 1978. Serial No. 95-H54,474p.

Descriptors: *Legislation, *Federal government, *Water resources research act, *Water resources council, Water resources development, Administrative agencies, Comprehensive planning, Desalination, Saline water, Planning, Water policy.

The Subcommittee on Water Resources, part of the United States Senate's Committee on Environment and Public Works, held hearings in 1977 to discuss water research and development. Chaired by Senator Mike Gravel, from Alaska, the subcommittee specifically discussed proposed bills which dealth with the Water Resource Council and the 1974 Water Resources Research Act. Opening statements were made by Senators McClure and Domenici. Senator McClure, while acknowledging that the hearings focused on a bill to extend the life of the Water Resource Council for another year, urged approval of a bill which would change the existing structure of the Council. His alternate bill would place the Council in the White House and strengthen its authority over water resource agencies. The other bill discussed by Senator McClure would provide varied funds for water research programs. Senator Domenici's statements concentrated on desalinization programs. Included in the text are the proposed bills, in their entireties, which were discussed. After the opening remarks were made, witnesses were called to comment on and discuss the bills. (Spiegel-Florida)
W79-02531

EMERGENCY SUSPENSION PROCEDURES FOR OUTER CONTINENTAL SHELF OIL AND GAS OPERATIONS,
Geological Survey, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-02532

FEDERAL CONSISTENCY WITH APPROVED COASTAL MANAGEMENT PROGRAMS,
Federal Register, Vol. 43, No. 49, p 10510-33, March 13, 1978. 1 tab.

Descriptors: *Coastal plains, *Federal government, *Administrative decisions, *Adoption of practices, Administrative agencies, Legislation, Regulation, Management, Permits, Continental shelf, Exploration, Environmental effects.

These final regulations provide coastal states, federal agencies, and other affected parties with policies and procedures for the implementation of the federal consistency provisions of the 1977 Coastal Zone Management Act, as amended. These regulations are issued by the National Oceanic and Atmospheric Administration (NOAA). The NOAA has attempted to minimize the likelihood of unnecessary delay in the administration of federal programs. However, the NOAA has favored comprehensive and complex coverage over simplicity to avoid uncertainty and conflict. The NOAA is still committed to the goal of implementing a federal consistency system which not only promotes the substantive coastal management purposes of the Act but also fosters the Act's objective of expeditions intergovernmental coordination. A matrix diagram which makes distinctions among the various types of federal actions subject to the Act's federal consistency requirements is included. A detailed discussion of specific comments and the NOAA's responses is also included. It was determined that environmental and inflationary impact statements were not required in this instance. (Quarles-Florida)
W79-02533

MINERAL MINING AND PROCESSING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS: PHOSPHATE ROCK MINING,
For primary bibliographic entry see Field 5G.
W79-02534

COASTAL ZONE MANAGEMENT APPROVAL REGULATIONS,
Federal Register, Vol. 43, No. 41, p 8378-8342, March 1, 1978. 6 tab.

Descriptors: *Coastal plains, *Federal government, *Administrative decisions, *Adoption of practices, Administrative agencies, Development, Management, State governments, Regulation, Planning, Natural resources, Water quality.

The National Oceanic and Atmospheric Administration (NOAA) has promulgated these interim final regulations seeking to revise and incorporate several sets of existing regulations dealing with development and approval of state coastal management programs. These regulations reflect more accurately the interpretation of program approval requirements being provided by the Office of Coastal Zone Management. The NOAA also wishes to respond to requests to discuss further some of the major issues addressed in the regulations prior to their finalization. Such an open process follows the spirit of the 1972 federal Coastal Zone Management Act, as amended. The interim final regulations include a discussion of the major issues and a section-by-section discussion of other comments received. Some reviewers felt the regulations did not adequately reflect the goal of preservation of unique coastal resources. Changes were made to emphasize the relationship between the proposed energy facility planning requirements and national interest considerations. The treatment of local programs is explored. The NOAA agreed that a more detailed performance review should be provided after program approval. If states have more stringent pollution control standards, these must be incorporated into the management program. (Quarles-Florida)
W79-02535

LEGISLATION AND REGULATION: WHAT'S NEW WITH PL 92-500,
For primary bibliographic entry see Field 5G.
W79-02537

THE CLEAN WATER ACT OF 1977,
For primary bibliographic entry see Field 5G.
W79-02538

TIDELANDS AND THE PUBLIC TRUST: AN APPLICATION FOR SOUTH CAROLINA,
B. W. Wyche.
Ecology Law Quarterly, Vol. 7, No. 1, p 137-70, 1978.

Descriptors: *Coastal marshes, *Ownership of beds, *Intertidal areas, *South Carolina, Tidal marshes, Marshes, Wetlands, State jurisdiction, Riparian rights, Public benefit, Environmental control, Judicial decisions.

Tidelands of coastal states are now recognized as resources of immense public value. As a means of protecting these lands against abuse and destruction, courts generally apply the public trust doctrine: tidelands, as well as lands underlying navigable, non-tidal waters, are held in trust for the benefit of the public. Whether tidelands are held in trust in South Carolina is open to question. The state is the presumptive owner of all South Carolina tidelands, but a private claimant can rebut this presumption by producing an unbroken chain of title back to an original grant from the sovereign and by showing specific language in the grant evincing the intent to convey the land to the mean low water mark. However, the South Carolina Supreme Court has declared in dicta that tidelands are held in trust for public purposes. This position is consistent with common law principles and decisions of state courts and the United States Supreme Court. However, the South Carolina Supreme Court has not defined or explained the scope, nature, and limitations of the tidelands trust. Presumably the trust encompasses all tidelands, not just those abutting navigable waters. (Rule-Florida)
W79-02539

NEGLECTED MARINE SANCTUARY LAW IS SHOWING SIGNS OF LIFE,
D. Laist.
Audubon, Vol. 83, No. 3, p 117-19, 1978.

Descriptors: *Legislation, *Aquatic life, *Protection, *Preservation, Marine animals, Ecosystems, Great lakes, Continental shelf, Coasts, Administrative agencies, Marine plants, Conservation.

Title III of the 1972 Marine Protection, Research, and Sanctuaries Act could prevent the despoliation of many of our nation's most valuable offshore areas. Title III calls for the establishment of marine sanctuaries, and after almost five years of neglect, the law is showing signs of vitality. The law provides authority for presidential approval of sanctuaries, and after almost five years of neglect, the law is showing signs of vitality. The law provides authority for presidential approval of sanctuaries: as far seaward as the edge of the continental shelf, in other coastal waters subject to the ebb and flow of the tide and in the Great Lakes and their connecting waters. The five categories of marine environment that can justify sanctuary status are: (1) habitat areas; (2) species areas; (3) recreation and esthetic areas; (4) research areas; and (5) unique areas. The operation of the marine sanctuaries program is discussed, as is its history. The author offers several explanations of why, until recently, the program has progressed at a slow pace. The turning point for the present brighter outlook for the program is attributed to President Carter's support for it in his 1977 environmental message. Since then, the program has been funded and administered by the National Oceanic and Atmospheric Administration. (Horwich-Florida)
W79-02540

STATE LAW CONTROLS TITLE TO ALLUVIAL FORMATIONS EVEN THOUGH ORIGINAL TITLE IS BASED ON EQUAL-FOOTING DOCTRINE OR FEDERAL GRANT,
J. L. Ross.
Texas Tech Law Review, Vol. 9, No. 2, p 381-91, Winter, 1977-78.

Descriptors: *Federal-state water rights conflicts, *Alluvium, *Accretion(Legal aspects), *Riparian rights, Legal aspects, Water law, Water policy, Federal jurisdiction, Water rights, Ownership of beds, Judicial decisions, Analysis.

Under the United States Supreme Court case of Oregon ex rel. State Land Board v. Corvallis Sand and Gravel Company, state law controls title to allovial formations even though original title is based on the equal-footing doctrine or federal grant. Even though the case was argued in terms of correct application of federal common law, the court decided the jurisdictional question of whether state or federal law should control title determinations of modified riverbed lands. State law should control unless some theory or factual situation indicates that federal grant claims did not govern. The decision to overrule Bonelli Cattle Company v. Arizona, which based federal jurisdiction of the equal-footing doctrine, was sound. However, the decision on federally granted riparian land was faulty because the court failed to distinguish between riparian rights associated with a federal grant and the equal-footing doctrine as possible sources of federal jurisdiction. Instead of deciding whether the facts contained an accretion issue, the court applied the same rational to grants that it did to the doctrine. (Rule-Florida)
W79-02541

THE WATER QUALITY IMPROVEMENT ACT OF 1970, THE 1972 AMENDMENTS AND STATE ANTIPOLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W79-02542

BANNING DETERGENT PHOSPHATES - THE DEBATE CONTINUES,
For primary bibliographic entry see Field 5G.
W79-02543

CALIFORNIA'S PROGRAM FOR DEALING WITH THE DROUGHT,
California State Dept. of Water Resources, Sacramento.
R. B. Robie.
Journal of the American Water Works Association, Vol. 70, No. 2, p 64-68, 1978.

Descriptors: *California, *Water shortage, *Remedies, *Droughts, Precipitation(Atmosphere), Reservoir storage, Water supply, Water storage, Groundwater basins, Surface waters, Water conservation, Drought tolerance.

Recently, California, along with much of the West, experienced some of the most severe drought conditions ever experienced. Nevertheless, California has been able to cope with the drought and may even be in a better position to prepare for future dry periods. California generally has only one rainy season each year, so numerous reservoirs have been built to store the runoff. As a result of the drought, groundwater levels around the state have dropped drastically. Agriculture and closely related industries have been hardest hit by the drought. Water rationing has been implemented in many urban areas. Other problem areas affected by the drought include fires, fish and hydroelectric power. The state Department of Water Resources has learned several lessons from the drought, and these are set forth. California has taken a number of actions to cope with the drought. The Governor's Drought Emergency Task Force was created. Many communities embarked upon voluntary and mandatory local conservation programs. Water exchanges and temporary diversions were arranged. The Department of Water Resources initiated a cloud seeding program. Other specific plans to cope with the continued drought are also set forth. (Quarles-Florida)
W79-02544

CONSUMER NOTIFICATION - PUBLIC AWARENESS OR THE SMOKING PISTOL,
California State Dept. of Health, Berkeley.
For primary bibliographic entry see Field 5G.
W79-02545

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Environmental Protection Agency, Washington, DC. Criteria and Standards Div
For primary bibliographic entry see Field 5G.
W79-02546

NONDETERIORATION AND THE PROTECTION OF HIGH QUALITY WATERS UNDER FEDERAL WATER POLLUTION CONTROL LAW,
For primary bibliographic entry see Field 5G.
W79-02547

ENVIRONMENTAL REGULATION OF UNITED STATES DEEP SEABED MINING,
Marshall-Wythe School of Law, Williamsburg, VA.
S. C. Whitney.
William and Mary Law Review, Vol. 19, No. 1, p 77-97, Fall, 1977.

Descriptors: *International waters, *Mining, *Exploitation, *Law of the Sea, United States, Regulation, Manganese, Technology, United nations, Oceans, Negotiations.

The deep-sea mining of managanese nodules is inevitable given increasing industrial demands and available economic and technological resources. This article concludes that Congress should enact legislation providing a guaranteed security for corporate investment and effort subject to compliance with sound regulatory and environmental principles. The author also suggests that an effort should be made to influence foreign countries to adhere to sound environmental safeguards in order to advance the goal of efficient, responsible exploitation of the seabed's natural resources. This could be accomplished through bilateral negotiations and agreements which could provide a basis for the emergence of favorable customary international law that would promote the negotiation of a viable Law of the Sea agreement. This article examines the nature of deep seabed mining and proposes a legislative framework within which commercial mining ventures could operate effectively. The article then discusses the problems which the United States faces when attempting to promote responsible development of deep-sea mining in a hostile international community. The international environment regime of law which will control exploration and exploitation until a Law of the Sea treaty is finalized, is also discussed. (Quarles-Florida)
W79-02548

THE SEABED NEGOTIATION AND THE LAW OF THE SEA CONFERENCE -- READY FOR A DIVORCE,
J. T. Smith, II.
Virginia Journal of International Law, Vol. 18, No. 1, p 42-59, Fall 1977.

Descriptors: *Law of the sea, *United nations, *Resource allocation, *Negotiations, International waters, Oceans, Continental shelf, Natural resources, Mining, United States, Exploitation, International law.

The procedural and substantive obstacles to successful conclusion of the seabed negotiations of the Third United Nations Conference on the Law of the Sea are so large that means must be found to divorce them from the rest of the Conferences work. This is the conclusion of this article which warns that, absent such a separation, the success of the entire Conference may be jeopardized. The most overt sign of restlessness in this area of negotiation has been the United States' statement that the portion of the new informal Composite Negotiating Text dealing with the seabed regime is fundamentally unacceptable. While the United States undertakes a serious review of conference substance and procedures, Congress is preparing legislation which will encourage American firms to mine the seabed despite the absence of an agreed-upon international regime. Other nations are also growing anxious over this troubled area of negotiation. The article examines the procedural failure of the Conference and the substantive obstacles of the seabed negotiations. Alternatives for resolving the seabed roadblock are suggested with a detailed plan of divorcing the seabed negotiations from the Conference. (Quarles-Florida)
W79-02549

SUBSIDENCE OF LAND CAUSED BY WITHDRAWAL OF PERCOLATING WATER IS ACTIONABLE ON THE THEORIES OF NEGLIGENCE AND NUISANCE IN FACT,
E. L. Huddleston.
Texas Tech Law Review, Vol. 9, No. 2, p 392-401, Winter 1977-78.

Descriptors: *Texas, *Judicial decisions, *Water rights, *Remedies, Nuisance, Negligence, Groundwater, Percolating water, Subsidence, Natural flow doctrine, Reasonable use, Land subsidence.

In Smith-Southwest Industries v. Friendswood Development Co., the Houston (Texas) Court of Civil Appeals held that subsidence of land caused by withdrawal of percolating water is actionable on the theories of negligence and nuisance in fact. Texas water law follows the English rule which allows a landowner to withdraw unlimited amounts of water without liability for injury to a neighbors well. However the tort law of negligence and nuisance can impose liability for subsidence of land. A person who uses his land in a negligent manner and causes injury to another's property is liable for their negligence. And to find a nuisance, a court weighs the injury to the plaintiff against the reasonableness and usefulness of the defendant's activity. Although the Houston court indicated that it solved the contradictions between the two laws--water law and tort law--by blending them, the author maintains that the court simply ignored the English rule, and recommends the Texas Supreme Court solve this conflict by abandoning the English rule completely. While the English rule may have been practical in earlier days, it has been rendered obsolete by societal changes. (Horwich-Florida)
W79-02550

EQUAL FOOTING DOCTRINE DOES NOT REQUIRE APPLICATION OF FEDERAL COMMON LAW TO RESOLVE OWNERSHIP OF LAND UNDERLYING NAVIGABLE WATERWAYS WHICH ARE NOT INTERSTATE BOUNDARIES,
C. E. Hagberg.
Tulsa Law Journal, vol. 12, no. 3, p 593-99, 1977.

Descriptors: *Riparian land, *Ownership of beds, *Judicial decisions, *Avulsion, River beds, Navigable waters, Common law, Federal-state water rights conflicts, Accretion(Legal aspects), Submerged lands act, Oregon, State jurisdiction.

In Oregon ex rel State Land Board v. Corvallis Sand and Gravel Co., Oregon brought an ejectment action, claiming title to two parcels of land. The first parcel had been part of a riverbed since before Oregon was admitted to the Union. The second became a riverbed in 1909, after statehood, following a major flood. The trial court--affirmed by the Oregon Court of Appeals--awarded ownership of the first parcel to the State. The 'equal footing doctrine' requires that newly admitted states acquired title to the riverbeds of all navigable waterways within their boundaries. The court applied the federal common law theory of avulsion to the second parcel and awarded it to the defendant. The case was reversed by the United States Supreme Court, which also reversed its former policy of expanding the situations where federal common law would apply. Thus state law shall govern the impact of accretion, avulsion, and reemergence upon ownership of land surrounding or underlying navigable waterways that do not form interstate boundaries. The author defends this decision, because states have unique interests in, and varying public policies with respect to, riparian lands. (Horwich-Florida)
W79-02551

SURFACE WATER FLOODING IN URBAN AREAS: RIGHTS AND REMEDIES UNDER THE COMMON ENEMY DOCTRINE,
J. P. George.
Tulsa Law Journal, Vol. 12, No. 3, p 574-92, 1977.

Descriptors: *Surface runoff, *Remedies, *Urban drainage, Floods, Common law, Urban runoff, Land development, Drainage effects, Urban development, Drainage.

Urban flooding is an ever increasing problem as land development intensifies in expanding metropolitan areas. Surface runoff can submerge land not ordinarily considered subject to flood damage. This article examines common law remedies available to resolve surface water drainage problems as exemplified in three geological situations. Its scope is limited to jurisdictions employing the modified common-enemy doctrine. The three situations are: (1) when the landowner is on the lower end of a watershed and upper development causes increased runoff velocity or volume; (2) when the landowner occupies a depression and subsequent development causes standing or slow draining water; and (3) when the landowner is the recipient of collected artificial discharge from another landowner. The artificially collected discharge generally involves negligence and a lack of good faith. Available remedies are injunctive relief, damages, or both. But the single lot depression and the increased general runoff problems usually present situations where no cause of action will lie unless the damaged party can show lack of care, excessive damage or malice, or can demonstrate that a

more adequate drainage system is feasible. This is because these problems arise from normal urban growth. (Horwich-Florida)
W79-02552

SOMETHING OLD, SOMETHING NEW: SOME THOUGHTS ON GROTIUS AND THE MARINE ENVIRONMENT,
J. Schneider.
Virginia Journal of International Law, Vol. 18, No. 1, p 147-64, Fall 1977.

Descriptors: *Law of the sea, *International law, *United Nations, *Conferences, International waters, Exploration, Exploitation, Compensation, Appropriation, Political aspects, Regulation.

The United Nations has had three conferences on the Law of the Sea (UNCLOS). Discussed here are the proposals and faults of the Third Conference (UNCLOS III) which took place in 1978. Coastal states will have, according to the proposals, sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living of their 200-mile economic zone. However, there shall be preserved in all 'economic zones' the traditional high seas freedoms for all states, such as navigation and overflight and of the laying of submarine cables and pipelines. The author criticizes the Convention for not adequately recognizing problems relating to the marine environment. The proposal states that in exercising its prerogative in this area, a coastal state must not hamper innocent passage of any other state's vessel. It can only prevent passage which is not innocent, which has traditionally meant only passage which is not prejudiced to the peace, good order or security of the coastal state. The author argues that pollution should be security of the coastal state. The author argues that pollution should be included in the category of 'not innocent.' Environmental protection must be given a more important place in attempts at international cooperation. (Horwich-Florida)
W79-02553

PROTECTING THE CALIFORNIA COAST.
Sierra Club Bulletin, Vol. 63, No. 5, p 11-12, June, 1978.

Descriptors: *California, *Coasts, *Planning, *Land development, Legislation, State governments, Permits, Conservation, Sewage, Beaches, Dredging, Wetlands.

Protecting the California coast from unrestricted development has not been an easy task. The turning point in the battle was the creation in 1965 of the San Francisco Bay Conservation and Development Commission. The Commission was the catalyst and model for a state-level coastal conservation program in the 1970's. The 1972 Coastal Initiative was finally passed to enact a statewide coastal protection law. The 1972 Coastal Act did not halt all coastal development but it did alter future coastline development. The law's most important effect was to enable the state to acquire parklands in desirable areas previously dominated by private landowners. Another result of the law was the preparation of the 1975 California Coastal Plan which stresses the idea that the coast should be treated as a unique place, where conservation has priority. Upon the expiratin of the 1972 Act in 1976, a weakened Coastal Act was passed, establishing a permanent California Coastal Commission. The Commission must rely on local governments and state and federal agencies to implement the new Act. The program has presently reached a critical point, with numerous controversies and opposition surrounding it. (Quarles-Florida)
W79-02554

ESTABLISHING LIABILITY FOR DAMAGE RESULTING FROM THE USE OF UNDERGROUND PERCOLATING WATER: SOUTHSOUTHWEST INDUSTRIES V. FRIENDSWOOD DEVELOPMENT COMPANY,
D. A. Wright.
Houston Law Review, Vol. 15, No. 2, p 454-68, January 1978.

Descriptors: *Texas, *Subsurface waters, *Reasonable use, *Judicial decisions, Damages, Percolating water, Withdrawal, Water levels, Negligence, Water rights, Groundwater, Subsidence.

Texas landowners brought a class action suit against a corporation alleging that the withdrawal of large quantities of percolating, subsurface water from beneath defendant company's land caused a severe subsidence of plaintiff's property. The trial court granted defendant's motion for summary judgment on the basis of the common law rule that a landowner has an absolute right to the water beneath his property. The appeals court reversed, stating the plaintiffs had a right of action based upon negligence and nuisance. The author views this decision as contrary to common law doctrine. The rationale for the seemingly harsh rule is explained and its adoption by Texas courts is traced. However, the majority of other states follow the doctrine of reasonable use. The various rules relating to property rights in subterranean waters are examined in some detail. The article urges the Texas Supreme Court to adopt the second of three options available in this water rights area: (1) make the absolute-use doctrine subject to tort liability for negligence; (2) adopt the doctrine of reasonable use; or (3) recognize that the common law rule was never intended to deal with situations where the damage was land subsidence. (Quarles-Florida)
W79-02555

ORGANIZING FOR A NATIONAL OCEANS PROGRAM,
Virginia Univ., Charlottesville. School of Law.
J. N. Moore.
William and Mary Law Review, Vol. 19, No. 1, p 1-15, Fall, 1977. 4 app.

Descriptors: *Oceans, *Administrative agencies, *United States, *Water conservation, Beaches, Legislation, Natural resources, Continental shelf, Federal government, Mining, Planning, Water policy.

Without a national oceans policy, the United States will continue to drift toward increased pollution of its beaches and lagging oceans development. Although great strides have been made toward the development of a national oceans program, we have reached a critical point in oceans policy. The principal organizational needs of a national oceans policy are: (1) upgrading the attention given the oceans in overall national priority; (2) development of national oceans goals and implementation programs; (3) centralization of oceans programs; and (4) more effective interagency coordination and Presidential oversight of programs. In order to reduce organizational weaknesses and build toward a national oceans program, the author suggests three modest changes: (1) creation of a Cabinet-level Marine Affairs Council to develop national ocean goals; (2) creation of an independent centralized agency reporting directly to the President; and (3) reorganization of the State Department's oceans effort into a genuine Bureau of Oceans and Environment. The basic reason given for these proposed changes is the lack of clear oceans goals in the nation's present policy. Diagrams illustrating the proposed organization of the author's suggestions are included. (Quarles-Florida)
W79-02556

HODGES V. OKLAHOMA WATER RESOURCES BOARD (WATER RESOURCES BOARD GRANT OF TEMPORARY PERMIT FOR NON-DOMESTIC GROUNDWATER USE UPHELD).
580 P. 2d 980-83 (Okla., 1978).

Descriptors: *Irrigation water, *Beneficial use, *Domestic water, *Oklahoma, Preferences(Water rights), Water permits, Administrative decisions, Water demand, Water districts, Competing uses, Water distribution(Applied), Water allocation(Policy).

Appellees Oklahoma Water Resources Board and permit applicant appealed a trial court ruling which reversed the Board's order granting a temporary permit to take and use ground water for spray irrigation. The trial court held that the Board's findings of a beneficial use and lack of waste were not supported by substantial competent evidence. The court also felt the Board had failed to address appellant local resident's argument that domestic ground water uses have priority, and the permit use would have a detrimental effect on domestic uses. Reversing the trial court, the Oklahoma Supreme court reinstated the Board order and held that spray irrigation could be a beneficial use, and that once an applicant shows what method he intends to use for irrigating a particular area, the Board has the authority to determine that a waste will or will not occur. Protestors who feel waste will occur must present their evidence to the Board. In this case, such evidence presented was deemed inconclusive. Additionally, the Supreme Court held that simply because it is not necessary to obtain a permit before taking water for domestic uses does not mean such uses have priority over water put to other beneficial use. (Rule-Florida)
W79-02557

BUTTS V. CITY OF SOUTH FULTON (CONSTRUCTION OF ROAD WHICH INTERFERED WITH NATURAL DRAINAGE AND CAUSED FLOODING CONSTITUTED ACTIONABLE NUISANCE).
565 S.W. 2d 879-83 (Tenn. Ct. App. 1977).

Descriptors: *Alteration of flow, *Flood damage, *Surface drainage, *Tennessee, Roads, Drainage, Surface runoff, Rain water, Surface waters, Flood control, Damages.

Plaintiff property owner brought action for money damages resulting from contruction of a road which interfered with natural drainage and caused water to back up and flood his land. The property had never been flooded or damaged by flood water before the construction. Defendant municipality had been informed that the lack of adequate drains could cause water back-up, but failed to install additional tiles to carry off the water. As a result, the road formed a dam which blocked the natural flow of water. When large amounts of rain fell, the water accumulated and flooded plaintiff's property. The Tennessee Court of Appeals held that wrongful interference with natural drainage of surface water which causes injury to an adjoining landowner constitutes an actionable nuisance. The court affirmed the trial court award of damages, but reversed an order requiring defendant to lower the road level or to install a pump and submit plans for removing water. The appeals court felt the order placed the trial court in a supervisory position for which it had not expertise, and that there were alternative remedies available. (Rule-Florida)
W79-02558

RULES AND PROCEDURES FOR APPLICATION FOR COASTAL CONSTRUCTION PERMITS.
Florida Dept. of Natural Resources, Tallahassee. Div. of Marine Resources.
Fla. Admin. Code, Ch 16B-24, secs 24.01 thru 24.09 (1978).

Descriptors: *Permits, *Florida, *Regulation, *Coastal structures, Legislation, Project planning, Administrative agencies, Construction, Coasts, Engineering, Beaches.

In pursuance with Florida statutes, these rules are promulgated to implement departmental policies and procedures for applying for any coastal construction permit. The regulations described herein deal with the permit application process and with conditions placed on such permits. Generally, no erosion control structure may be constructed or modified unless a valid permit has been issued by the Department of Natural Resources (Department). This rule does not apply if the Department's Division of Marine Resources determines that the activity is not covered by the regulations. In order to obtain a permit an application must be submitted

to the Bureau of Beaches and Shores (Bureau). Information such as evidence of ownership as to the land in question and a set of contruction plans must be included. All applications must be accompanied by a fee, unless the applicant is a governmental unit. If the project is acceptable, notice will be mailed to parties interested in the proposed structure in order to obtain their recommendations. Later, the Bureau shall make its final recommendations. Accepting a permit imparts a duty on the applicant to follow all permit conditions imposed by the Department. (Spiegel-Florida)
W79-02559

NIAGRA OF WISCONSIN PAPER CORP. V. WISCONSIN DEPT. OF NATURAL RESOURCES (STATE EFFLUENT DISCHARGE PERMITS MUST BE MODIFIED IN ACCORDANCE WITH STATE LAW TO COMPLY WITH EPA STANDARDS.
268 N.W. 2d 153-64 (Wis. 1978).

Descriptors: *Effluents, *Federal water pollution control act, *Permits, State jurisdiction, Regulation, Water quality standards, Pollution abatement, Technology, Phosphates, Waste water treatment, Industrial wastes.

Two paper companies instituted actions against the Wisconsin Department of Natural Resources (DNR) when the DNR refused to alter Wisconsin Pollution Discharge Elimination System permits it previously issued to the companies. The permits incorporated interim effluent limitations based upon guidelines published by the federal Environmental Protection Agency (EPA), and were to be in effect until 1978. However, the permits were to be modified in 1977 following the EPA's scheduled adoption of 'best practicable control technology currently available' effluent limitation standards. The final standards adopted by the EPA in 1977 were less stringent than those in the original DNR permit. The state supreme court held that because of a state law requiring that DNR rules relating to effluent limitations shall comply with and not exceed the 1977 EPA requirements, the original permits should have been modified to comply with the less stringent and final 1977 EPA standards. Finally, noting the difference between effluent limitations and water quality standards, the court ruled a phosphorus limitation in the permit could not be retained unless the DNR could link its necessity to an actual water quality standard violation. (Easterbrook-Florida)
W79-02560

OKLAHOMA WATER RESOURCES BOARD V. CITY OF LAWTON (SPRINGWATER HEATED AS STREAM WATER FOR APPROPRIATION PERMIT APPLICATION),
580 P. 2d 510-14 (Okla. 1978).

Descriptors: *Oklahoma, *Competing uses, *Appropriation, *Spring waters, Administrative agencies, Streams, Water users, Water consumption(Except consumptive uses), Permits, Land development, Irrigation, Municipal water.

A private landowner was granted a temporary permit to appropriate 400 feet of ground water annually for recreation, housing development and commercial irrigation uses by the Oklahoma Water Resources Board. Lawton city officials objected, claiming the water to be appropriated was part of the watershed that would normally drain into the lake which supplied the city with water. A trial court reversed the Board. Affirming the trial court, the state supreme court held that even though the water to be appropriated came to the surface in the form of a spring and ran across the surface in a nondefinite course for such a short distance it did not constitute a 'definite' stream, it could nevertheless only be appropriated as stream water, not ground water. And, to appropriate stream water, the court noted the Board must make certain statutory determinations, including: (1) there is unappropriated water available in the amount applied for; (2) a present or future need for the water exists, and the proposed water use is a beneficiticial use; and (3) the proposed use does not interfere with domestic or existing appropriative uses--like that of Lawton. (Easterbrook-Florida)
W79-02561

KUIPER V. WARREN (CONDITIONAL WELL PERMIT OWNER MUST APPLY WATER TO BENEFICIAL USE OR LOSE PERMIT).
580 P. 2d 32-36 (Colo. 1978).

Descriptors: *Colorado, *Well permits, *Well regulations, *Beneficial use, Water supply, Standards, Regulation, Administrative decisions, Water users, Groundwater, Unappropriated water.

Defendant, the holder of a conditional well permit, was ordered by the Colorado Ground Water Commission to cease operation of the well because the permit under which it had been constructed had expired. The expiration occurred because the defendant permit holder had failed to apply the well water to a beneficial use within the time period stipulated in the permit. When the well operator refused to comply with the Commission's order, plaintiff state engineer was granted injunctive relief by a trial court that ordered the well owner to stop using the well. In affirming the Commission's and trial court's decisions, the state supreme court ruled that the appropriator was required to place the water to a beneficial use within the time prescribed by the permit statute; that the statutory time provisions in the designated ground water context did not impremissibly limit the constitutional right to appropriate unappropriated waters; and that the Commission had not acted in an arbitrary or discriminatory fashion when it enforced the time limit, contrary to the defendant's claim that numerous other well permit owners had not had the time limit enforced against their appropriations. (Easterbrook-Florida)
W79-02562

BAUER V. PRESTWICH (USE OF WATER ON LAND MAKES IT APPURTENANT TO THE LAND).
578 P. 2d 1283-86 (Utah 1978).

Descriptors: *Utah, *Water rights, *Spring waters, *Adjacent land owners, Unappropriated water, Springs, Water uses, Water demand, Competing uses, Judicial decisions, Groundwater availability.

Private landowner brought an action against defendant adjacent landowners seeking to quiet title to waters of a spring on his land and to enjoin defendants from using the spring water. The trial court quieted the title and enjoined defendants from interfering with plaintiffs rights to use the water. Affirming the trial court ruling, the Utah Supreme Court held that the use of water upon a tract of land makes it appurtenant to that land, and, unless the right to the water was separately deeded away, the right to the water would pass with the land. Here, the water from this spring was found to have been used continuously by plaintiff and his predecessors in interest since before 1903--a sufficient period of time to render the right to the water appurtenant to the land and to validate plaintiff's assertion of a 'diligence claim' to the water. A similar 'diligence claim' to the water by defendant was denied because of a lack of proof that the initial use of water prior to 1903 was every conveyed to defendant. Two justices dissented to the decision. (Easterbrook-Florida)
W79-02563

YOUGHIOGHENY RIVER-DESIGNATION AS A WILD RIVER; MINING OF MINERALS; RULES GOVERNING USE AND DEVELOPMENT; FUNDS TO PURCHASE PROPERTY.
Md. Code Ann. secs 8-408 thru 8-410 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Wild River Act, *Regulation, Administrative agencies, Planning, State governments, Mining, Zoning, Strip mines, Scenic easements, Wild rivers, Eminent domain, River regulation, Condemnation, Adjacent land owners.

The Youghiogheny River between Millers Run and the city of Friendsville is designated a wild river. Strip mining or open-pit mining is prohibited in this river, except for areas which have already been mined and are not reclaimed. The area designated as scenic shall be confined to adjacent land areas visible from the river or its shore. Development of scenic areas adjacent to the river shall be regulated by the Department of Natural Resources after review by the local advisory board and the Scenic and Wild rivers Review Board. Development includes any structure, addition or alteration placed or constructed on land or water. If any Department rules or statutory prohibitions under the Scenic and Wild River Program result in the taking of a property right without just compensation, the property so taken shall be paid for. Funds from the Program Open Space may be used for this purpose if the acquisition has been previously approved by the General Assembly. (Molloy-Florida)
W79-02564

SHORE EROSION CONTROL.
Md. Code Ann. sec 8-1005 (1974), as amended, (Supp 1976).

Descriptors: *Maryland, *Erosion control, *Financing, *Loans, Beach erosion, Legislation, Construction, Land management, Adjacent land owners, Local governments, Diversion structures, Tax rates, Interest, Assessments, State governments, Real property, Property values.

The Shore Erosion Control Construction Loan Fund is created to provide interest-free loans to individuals or local governments for construction of shore erosion structures. The state shall levy a special real estate tax on private property benefited by erosion control projects, and these monies shall be considered repayments of principal on loans from the Fund. This tax shall be levied by agreement between state and property owner for a period not exceeding 25 years, to compensate the state for project construction cost. Annual appropriation of general funds may also be added to the Fund to insure an effective yearly construction program. Approved projects may receive loans for 100 percent of the first $40,000 of cost, 50 percent of the next $20,000 of cost, 25 percent of the next $20,000 and 10 percent of construction costs exceeding $80,000. If two or more property owners are included within a single project and project construction cost exceed $80,000, the land of each is considered separately for computing net project construction cost under this formula. (Molloy-Florida)
W79-02565

BOHEMIAN BRETHREN PRESBYTERIAN CHURCH V. GREEK ARCHDIOCESAN CATHEDRAL OF THE HOLY TRINITY (RUNOFF DAMAGE RESULTING FROM GRADING OF ADJOINING PROPERTY).
405 N.Y.S. 2d 926-29 (Sup. Ct. 1978).

Descriptors: *Reasonable use, *Relative rights, *Surface runoff, *New York, Alteration of flow, Natural flow doctrine, Water law, Urban runoff, Rainfall, Storms, Damages.

Plaintiff church sought $150,000 for damages allegedly resulting from surface water runoff flowing from defendant church's property onto plaintiff's adjoining property. Defendant admitted it altered its property, but claimed the improvements were made to fit the property for a reasonable and rational use. Consequently, in a pretrial motion, defendant soughts dismissal of the suit, claiming plaintiff had not stated a cause of action requiring a trial. The New York trial court noted this suit raised the legal question as to the extent to which a land owner may cast off surface water onto the property of his neighbor. Three theories were examined. Under the natural flow theory, the owner of land who interferes with the natural flow of water is liable for damages caused to lower land. Under the common enemy rule, each owner has the absolute right to cast off waters from his land as he sees fit. In finding that the plaintiff had stated

a valid cause of action, the Court held that the reasonable use theory--under which a landowner who alters the flow of surface waters is liable for injury when his interference is unreasonable--must be applied in New York. (Stump-Florida)
W79-02566

IN RE WATER RIGHTS OF THE CIBOLO CREEK WATERSHED (LANDOWNER'S CLAIM OF EQUITABLE RIPARIAN WATER RIGHTS DENIED).
568 S.W. 2d 155-59 (Tex. Ct. App. 1978).

Descriptors: *Texas, *Water rights, *Riparian rights, *Irrigation practices, Streams, Competing uses, Water users, Water demand, Administrative decisions, Watershed management, Water distribution(Applied), Irrigation water.

The owner of two tracts of land on Cibolo Creek initiated an administrative adjudication of his water rights before the Texas Water Rights Commission. The adjudication was authorized by the state's Water Rights Adjudication Act (Act). One tract, located in Wilson County, was found to have a right to 80-acre feet based upon prescription and equity. The second tract, located in Guadalupe County, was found to have no recognizable water right. After dismissing the landowner's attack on the constitutionality of the Act, the review court held that in the absence of specific grants of irrigation water rights, land acquired under under Spanish and Mexican land grants--as were the two tracts here--do not have appurtenant riparian irrigation rights. The courts also held that the owner of a tract which had been irrigated with water from the creek for many years did not have a vested equitable right to creek water for irrigation. Finally, the court ruled that the state, or its predecessor soverignty, is the source of all titles; consequently, there exists a presumption of ownership in favor of the state until a claimant can show a valid grant of water rights out of the soverignty. (Easterbrook-Florida)
W79-02567

PETERSON V. GROUND WATER COMMISSION (EVIDENCE OF OVERAPPROPRIATED GROUND WATER RESOURCES SUFFICIENT TO DENY WELL CONSTRUCTION PERMIT APPLICATION).
579 P. 2d 629-35 (Colo. 1978).

Descriptors: *Colorado, *Groundwater resource, *Well permits, *Hydrograph analysis, Groundwater availability, Well data, Water rights, Administrative decisions, Hydrographs, Appropriation, Unappropriated water, Water level fluctuations.

Plaintiff landowner appealed a Colorado Ground Water Commission decision denying him permission to construct a well and to appropriate designated ground water from the Northern High Plains Designated Ground Water Basin. The permit application was denied when the Commission determined that water within a three-mile circle of the proposed well site was over appropriated and that the proposed well would unreasonably impair existing water rights. Affirming the denial, the state Supreme Court held that prior appropriators are entitled to protection against unreasonable impairment of their rights under the state's Ground Water Management Act, regardless of their decision to make an objection or not. Although the Court specifically disapproved of certain Commission application processing/permit granting procedures, it concluded that hydrograph interpretation evidence offered by expert witnesses for the Commission was sufficient to conclude that unappropriated water did not exist, and that plaintiff's well would unreasonably impair existing water rights in plaintiff's 'circle.' Even though the Commission's and lower court's use of the disapproved procedures was deemed to be erroneous by the Court, the error was not sufficient to reverse the permit application denial. (Easterbrook-Florida)
W79-02568

CONCERNED CITIZENS FOR ORDERLY PROGRESS V. COMMONWEALTH OF PENNSYLVANIA, DEPT. OF ENVIRONMENTAL RESOURCES (SEWAGE FACILITY CONSTRUCTION PERMIT UPHELD).
387 A. 2d 989-95 (Pa. Commw. Ct. 1978).

Descriptors: *Pennsylvania, *Sewage treatment, *Sewers, *Overland flow, Sewage disposal, Water pollution sources, Discharge(Water), Flood flow, Waste water treatment, Administrative decisions, Permits.

Plaintiffs, a concerned citizens group, affected land owners and a township, brought this action seeking review of a decision of the defendant Pennsylvania Department of Environmental Resources (DER) to grant a permit authorizing construction and operation of sanitary sewers and a sewage treatment plant. The permit was granted to Emerald Enterprises, Inc. The facilities were to serve an approved development. The Court noted its scope of review of DER decisions mandated that it affirm the DER decision unless appellant's constitutional rights were violated, there was an error of law, or there was insufficient evidence to support a finding of fact. Affirming the DER decision, the court made the following findings: (1) the state's Clean Streams Law mandating consideration of present and possible future use of waters does not prohibit changes in those uses; (2) an administrative review board fending that the stream and bog involved here were natural discharge areas rather than recharge area, with sufficient evidence, compiled with requirements of the Clean Streams Law; (3) there was no error in lack of consideration of potential flooding where the potential was purely speculative. (Stump-Florida)
W79-02569

SPEARS V. BERLE (WETLANDS PROPERTY USE RESTRICTIONS NOT A FAKING WHEN SERVING A PUBLIC PURPOSE).
407 N.Y.S. 2d 590-97 (App. Div. 1978).

Descriptors: *New York, *Wetlands, *Freshwater, *Permits, Legislation, Water law, Legal aspects, Condensation, Water permits, Land use, Environmental control.

Plaintiffs, owners of two parcels of land contaning freshwater wetlands, brought this proceeding seeking review of the denial of their application for a permit to remove humus, sand, and stone from the wetlands. New York's Fresh Water Wetlands Act (Act) requires that a permit be obtained from the Commission of Environmental Conservation in order to carry out virtually any activity on a freshwater wetland. A major question considered here by the Court was whether the use restrictions placed on plaintiffs' lands by the Act constitute a taking. After extensive discussion, the Court concluded that once it is demonstrated the property use restrictions serve some public purpose, the property owner must establish that the resulting hardship deprives him of any reasonable use of the property. Once this is established a 'de facto' taking will be determined to have occurred. If this test is met, the property owner may be entitled to compensation pursuant to the statute. However, the burden is on the property owner to show a hardship. In this case, the Court held that plaintiffs had not met this burden. (Stump-Florida)
W79-02570

WESTERN WATER LAWS AND IRRIGATION RETURN FLOW,
Resources Administration and Development, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W79-02575

THE LAW OF THE SEA CONFERENCE AT THE CROSSROADS,
United Nations, New York. Bulgarian Delegation.
A. Yankov.
Virginia Journal of International Law, Vol. 18, No. 1, p 31-41, Fall 1977.

Descriptors: *Law of the sea, *United Nations, *International law, *Negotiations, International waters, Jurisdiction, Oceans, Exploration, Exploitation, Continental shelf, Natural resources, Resource allocation.

The Third United Nations Conference on the Law of the Sea recently published the Informal Composite Negotiating Text. The upcoming Seventh Session may provide substantive compromise solutions to fundamental unresolved problems. There appear to be three common concerns among the delegations: (1) that the success of the Conference is of great importance; (2) that a compromise resolution of the outstanding issues is urgently needed; and (3) that the slow negotiations are being overtaken by unilateral action. The Conference is faced with the problem of reconciling opposing national claims and interests and harmonizing long-term perspectives on a global scale with considerations based on expediency and the geographical positions of individual states. The resolution of this dilemma requires an analytical and pragmatic approach in consideration of existing international realities. A general assessment of the work of the Conference leads to the conclusion that substantial progress in many areas has been made, but the concentrated negotiating effort needed to resolve the remaining issues should not be underestimated. Among the major unresolved issues, two categories are of critical importance: the regime of the international seabed and the status of the economic zone. (Quarles-Florida)
W79-02577

OCEAN AND COASTAL LAW TEACHING MATERIALS VOL. II - COASTAL LAW,
North Carolina State Univ. at Raleigh. Sea Grant Coll. Program.
T. J. Schoenbaum.
Sea Grant Publication UNC-SG-77-09, April, 1977, 363 p, $5.50. NOAA 04-6-158-44054.

Descriptors: *Coasts, *Water law, *Water poliby, *Legal review, Judicial decisions, Legal aspects, Legislation, Oceans, Law of the sea, Continental shelf, Law enforcement, Evaluation.

This compilation of diverse teaching materials examines the interrelationship between the law of the sea and legal problems associated with the coastal zone. Recognized is the fact that coastal planning decisions will affect how ocean resources are developed, and conversely, that development of ocean resources will impact upon the coastal zone. General topic areas included in this volume are public and private rights in coastal areas, and comprehensive coastal planning law. More specific areas covered include: (1) the public trust doctrine, which maintains that lands under navigable waters are held in trust by the government for use by the public; (2) shoreline changes; (3) public access to beaches; (4) conservation and development of public lands; (5) the regulatory and civil works activities of the U.S. Army Corps of Engineers, including consideration of the Federal Rivers and Harbors and Water Pollution Control Acts; (6) state regulatory activities; (7) the Federal Coastal Zone Management Act and similar state laws; (8) implementation of coastal planning; (9) and constitutional issues related to the coastal zone. These topics are covered through consideration of judicial decisions, statutes, and textual notes. (Malefatto-Florida)
W79-02578

NEPA'S EFFECT ON THE CONSIDERATION OF ALTERNATIVES: A CRUCIAL TEST,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-02607

A PROGRAM TO PROMOTE IRRIGATION CONSERVATION IN IDAHO,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 3F.
W79-02671

INTERIM REPORT OF THE GOVERNOR'S TASK FORCE ON WATER RESOURCES.
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6D.
W79-02700

ECONOMIC INCENTIVES FOR INSTITUTIONAL CHANGE: THE CASE OF THE VIRGINIA WETLANDS ACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economies.
R. R. Carriker.
PhD Dissertation, November, 1976. 145 p.

Descriptors: *Wetlands, *Virginia, *Legislation, *Economic justification, Marshes, Land use, Economic feasibility, Economics, Decision making, Natural resources, Water demand, Marsh management, Market value.

The case of the Virginia Wetlands Act is presented as a problem setting within which to explore the view that protection of ecologically productive wetlands was associated with increases in demand for those goods, services, and activities dependent in some way on the ecological services of wetlands. A case study approach was used to examine the influence on residential land prices achieved by filling or draining saltmarshland. The market value of land is defined within the context of economic theory of rent. A land value comparison technique was used to identify market price differentials attributable to waterfront amenities of marshlands as residential sites. Changes in this differential over time are taken as a measure of the time rate of increase in social benefits attributed to development uses of marshes. Using estimates generated by other studies of parameters for the demand for sport fisheries, and time series observations on variables which influence demand for sport fishing in the Chesapeake Bay, estimates were made of the time rate of change in social benefits attributable to ecological productivity of undeveloped wetlands. Other sources of value for undisturbed wetlands were also noted. (Steiner-Mass)
W79-02721

COLORADO RIVER DEVELOPMENT, (COLORADO RIVER BASIN),
Upper Colorado River Commission, Salt Lake City, UT.
I. V. Goslin.
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p 18-60. University of Arizona Press, Tucson, 1978. 4 fig, 1 tab, 7 ref.

Descriptors: *Colorado River Basin, *Colorado River, *History, *Legislation, *Legal aspects, Regional analysis, River basins, Water law, Water management(Applied).

This outline of the history of the development of the Colorado River offers a broad look backward at the influences that had led to present conditions, as well as a base from which to analyze the consequencs and relative values of alternative choices relating to the future. Events covered include early exploration/navigation, early irrigated agriculture, modern irrigation (including the Salt River Project, Arizona; Strawberry Valley Project, Utah; and the Imperial Valley, California), the need for water storage reservoirs, and the 1922 Fall-Davis report. A detailed description of the evolution of the 'law of the river' follows, including the Colorado River Compact, the Boulder Canyon Project Act, the Mexican Water Treaty, the Upper Colorado River Basin Compact, the Colorado River Storage Project Act, the Fryingpan-Arkansas Project Act, the Colorado River Basin Project Act, the Water Resources Planning act, the National Water Commission Act, the National Environmental Policy Act, and the Federal Water Pollution Control Act, together with a summary of the myriad legal problems deriving from this incredibly complex historical sequence of legislation. He concludes with a brief discussion of new regional trends in which he reminds us that 'because there is no certain method of augmenting the limited water resources of the river system, future water development in the basin will depend upon sophisticated intensive management whose goal will be the best conservation and use of water for the greater economic and social values...' (See also W79-02732). (Paylore-Arizona).
W79-02734

POLITICS OF WATER ALLOCATION, (COLORADO RIVER BASIN),
Arizona Univ., Tucson.
H. Ingram.
In: Values and Choices in the Development of the Colorado River Basin, ed. by D. F. Peterson and A. B. Crawford, p 61-75. University of Arizona Press, 1978. 17 ref.

Descriptors: *Colorado River Basin, *Federal government, *Cost analysis, *River basins, Decision making, Political aspects, Evaluation, State governments.

This author maintains that Federal domination of decisions on water allocation has imposed costs upon the Colorado River Basin in terms of the quality of the decision making process and the reationality of water policy. Her arguments are based on consideration of costs to the Basin of Federal water development: e.g. limitations of choice imposed on regional equity and by Federal initiatives; the bias of choice introducted by Federal evaluation; information affected by Federal standards and limited by pressure toward unity as well as by pressure for early action; and finally lack of incentive for State planning and the inadequacies of Federal water policies pursued. She concludes by giving evidence of change within the Basin, particularly evidence that the grip which Federal water politics has had upon the Basin may be loosening, with the proportion of Federal investtment in western water development showing a decline. Nevertheless, account must be taken of the fact that much future planning is still taking place on the Federal level or within corporations based outside the Basin which Basin decision-makers find difficult to hold accountable. She makes a final plea to try again to achieve a Basin-wide setting of goals and objectives so that proposed resources projects can be evaluated in light of the kind of future the Colorado River Basin envisions for itself. (See also W79-02732). (Paylore-Arizona).
W79-02735

POLICY GOALS AND VALUES IN HISTORICAL PERSPECTIVE, (COLORADO RIVER BASIN),
Colorado State Univ., Ft. Collins.
For primary bibliographic entry see Field 6B
W79-02736

PUEBLO WATER RIGHTS ON THE UPPER RIO GRANDE,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
W. J. Balch, and J. W. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 392, Price codes: A05 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Report No. 098 Technical Completion Report, 1978, 86p, 3 fig, 4 tab, 50 ref. OWRT B-055-NMEX(1), 14-34-0001-7125.

Descriptors: *Pueblo Indians Water Rights, *Water rights, Water utilization, Irrigation, Water allocation, Prior appropriation, Surface water, Groundwater, *New Mexico, *Rio Grande River(NM), Indian water rights, Indian reservations, *Winter's doctrine, Tesuque Pueblo(NM), Pojaque Drainage Basin(NM), Santa Fe County(NM).

This study concerns the water rights of the Pueblo Indians on the Upper Rio Grande using the Tesuque Pueblo as a case study. The Tesuque Pueflo is one of four Indian pueblos involved in a legal dispute over the water rights of the Pojaque Drainage Basin, located in Santa Fe County, New Mexico. A genral backround affecting this dispute is presented which includes the general legal status of Indian water rights in the United States at the present time and the past usage of water by the Pueblo Indians. The Tesuque Pueblo's case is disucssed with respect to this background, the possible allocation of water rights between the Tesuque Pueblo and their non-Indian neighbors, and the effect of utilizatin of these water rights on the immediate hydrologial system. (Stockton-New Mexico)
W79-02818

INSTITUTIONAL ARRANGEMENTS FOR AREA-WIDE QUALITY PLANNING AND MANAGEMENT, SECTION 208 APPLIED IN THREE METROPOLITAN AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering
For primary bibliographic entry see Field 5G.
W79-02819

ISSUES, INTERESTS AND POWER: ENVIRONMENTAL POLITICS IN THE COMMUNITY SETTING,
Delaware Univ., Newark.
For primary bibliographic entry see Field 6B.
W79-02825

SOCIAL IMPACTS FROM WILDLIFE WITHIN THE COLUMBIA BASIN IRRIGATION DISTRICT,
Washington State Univ., Pullman. Dept. of Forest and Range Management.
For primary bibliographic entry see Field 6B.
W79-02839

WATER RESOURCES RESEARCH SUPPORT PROGRAM 1978-1979,
Department of Fisheries and Environment, Ottawa (Ontario). Inland Waters Directorate.
1978. 20 p., Text in English and French.

Descriptors: *Investigations, *Water resources, *Universities, Model studies, Econometrics, Social aspects, Water pollution control, Sediments, Hydrology, Subsurface waters, Contamination(Water), Snow, Ice, Permafrost, *Canada, *Alphabetical listing, *Institutional aspects, *Research.

The Department of the Environment, on the recommendation of the Water Resources Research Support Program Review Group, has agreed to provide a total of $1,000,000 for water-related environmental research during 1978 to 1979 to 24 Canadian universities. The Water Resources Research Support Program provides for innovative research relevant to Departmental concerns and responsibilities for water resources research in the natural and social sciences with emphasis on water management issues. By fostering the interest of university researchers, it thereby utilizes their knowledge and expertise in solving water research problems, and provides opportunities for their participation in socially relevant environmental research. The concerns and responsibilities of the Inland Waters Directorate include a comprehensive research program with which the Water Resources Research Support Program is integrated Some of the current priorities of this research agreement program with universities are: Economic, social and institutional aspects; water and sediment quality aspects; hydrologic modelling; subsurface contamination; hydraulics of water systems; snow and ice; resources data. (WATDOC)
W79-02928

6F. Nonstructural Alternatives

NEPA'S EFFECT ON THE CONSIDERATION OF ALTERNATIVES: A CRUCIAL TEST.
Stanford Univ., CA. Dept. of Civil Engineering
For primary bibliographic entry see Field 5G
W79-02607

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer District, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W79-02717

AN ECONOMIC ANALYSIS OF ALTERNATIVE FEDERAL FLOOD DAMAGE ASSISTANCE PROGRAMS.
Cornell Univ., Ithaca, NY.
M. J. Rettger.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-291 341, Price codes: A11 in paper copy, A01 in microfiche. MS Thesis August 1977. 222 p, 18 fig, 38 tab. OWRT A-074-NY(1), 14-34-0001-7068.

Descriptors: *Flood damage, Programs, *Simulation analysis, *Cost analysis, Evaluation, Costs, Benefits, Mathematical models, Systems analysis, *Risks, Flood control, Model studies, *Alternative costs, *New York, Non-structural alternatives, Binghamton(NY), *Flood insurance programs.

An economic analysis of alternative flood relief programs is presented, based on the simulated flooding experience of the Binghamton (N.Y.) metropolitan area. The theory of consumer choice under conditions of uncertainty is used to develop evaluation criteria for flood insurance and disaster loan programs based on the benefits and costs of each program to both the public and the private sectors. A simulatin model is then designed to provide data for empirical implementation of the program analysis. The flood relief simulator is applied to a variety of possible assistance programs, including the national Flood Insurance program and the Small Business Administration disaster loan program. Model results suggest that program designs cause substantial variations in costs, not only in terms of total outlay, but also in the distribution of costs between the government and individuals. In general, the actuarial flood insurance program is a preferred choice based on total program costs. None of the programs studied have significant incentives on the relocation of flood-prone properties away from areas of high flood hazard.
W79-02824

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL IMPACT ASSESSMENT.
Lyndon B. Johnson School of Public Affairs, Austin, TX.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 268. Price codes: A12 in paper copy, A01 in microfiche.

Descriptors: *Computer models, *Environmental engineering, *Planning, *Systems analysis, *Water resources development, Administrative agencies, Computers, City planning, Electric power, Environment, Environmental control, Federal government, Land use, Legal aspects, Mathematical models, Surveys, Waste disposal, Water law.

The ways in which environmental impact statements are prepared crucially depend upon the analysts' ideas of why the statement is being prepared, what purposes it is intended to serve, and what audiences it is intended to reach. One possible purpose of the impact statement is simply to comply with the letter of the law requiring that it be prepared. An impact statement complies if it includes the five points listed in the law: impacts of the action, unavoidable adverse effects, alternatives that had been considered and rejected, tradeoffs between long-term and short-term effects and irreversible commitments of resources. Other possible purposes of environmental impact statements are: to provide full disclosure of all significant effects of a proposed action on the quality of the human environment, to communicate information about environmental effects to audience outside the agency, and to improve the analysis and comparison of alternative proposals. Unfortunately, the statement itself has remained largely a legal document, whose content too often fails to contribute effectively to the process of selecting among alternative major actions. (Jordan-Florida)
W79-02524

ENVIRONMENTAL ASSESSMENT - ALTERNATIVES OF GENERAL MANAGEMENT PLAN AND WILDERNESS STUDY FOR CAPE LOOKOUT NATIONAL SEASHORE, NORTH CAROLINA.
National Park Service, Denver, CO. Denver Service Center.
Feb. 1978, 134 p., App.

Descriptors: *North Carolina, *Alternative planning, *National seashores, *Management, Legislation, Recreation, Public access, Parks, Environmental effects, Barrier islands, Freshwater, Comprehensive planning.

A general management plan is necessary for the preservation of North Carolina's Cape Lookout National seashore's natural values as well as to provide public access for the use and enjoyment of the area. A wilderness study is necessary to consider wilderness preservation of suitable areas along the seashore. This document attempts to analyze: critical resources and suggest alternatives visitor use and development strategies; and wilderness proposals for the area. From the various comments and components of the alternatives received during review of the document, a general management plan and a wilderness study will be formulated. As an initial step in developing a plan, a statement of management was prepared and made available for public review. The most frequently mentioned responses are listed. The legislative background concerning the area is explained. The legislative mandate, agreements, and regulations that guide planning for the area are set forth. Available resource information and ongoing studies relating to the area are explained. The area environment is described in detail. Five alternatives are set forth in detail, along with each alternative's projected impacts and adverse effects and mitigating measures. (Quaries-Florida)
W79-02525

ENVIRONMENTAL REGULATION OF UNITED STATES DEEP SEABED MINING,
Marshall-Wythe School of Law, Williamsburg, VA.
For primary bibliographic entry see Field 6E.
W79-02548

PROTECTING THE CALIFORNIA COAST.
For primary bibliographic entry see Field 6E.
W79-02554

APPLICATION OF FIVE METHODS FOR MEASUREMENT OF WILDLIFE VAUE; LOWER SHEYENNE RIVER BASIN, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 2I.
W79-02605

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. INTERIM SYNTHESIS: BEAUFORT/CHUKCHI.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-02608

SPECIES, HABITATS AND PROCESSES SENSITIVE TO OCS DEVELOPMENT,
Environmental Research Lab., Fairbank, AK. Arctic Project Office.
For primary bibliographic entry see Field 5C.
W79-02609

TROPHIC INTERACTIONS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
For primary bibliographic entry see Field 5C.
W79-02610

PROBABLE IMPACTS AND CONSEQUENCES OF OIL DEVELOPMENT,
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
For primary bibliographic entry see Field 5C.
W79-02611

EFFECTS OF GRAVEL MINING AND CONSTRUCTION OF GRAVEL ISLANDS AND CAUSEWAYS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
For primary bibliographic entry see Field 5C.
W79-02612

ENVIRONMENTAL HAZARDS TO OFFSHORE OPERATIONS.
Environmental Research Lab., Fairbanks, AK. Arctic Project Office.
For primary bibliographic entry see Field 5C.
W79-02613

ECOLOGICAL EFFECTS OF AN ARTIFICIAL ISLAND, RINCON ISLAND PUNTA GORDA, CALIFORNIA,
Dames and Moore, Los Angeles, CA.
G. F. Johnson, and L. A. deWit.
Army Coastal Engineering Research Center Miscellaneous Report No. MR-78-3, September 1978. 108 p, 21 fig, 4 tab, 20 ref, 7 append. DACW 72-76-C-0011.

Descriptors: *Ecology, *Offshore platforms, *Environmental effects, *Water quality, Resources development, Biota, Water resources, California, Oil wells, *Outer Continental Shelf, *Artificial Islands, Ecological effects.

Marine ecological conditions at Rincon Island, located approximately 0.8 kilometer offshore between Ventura and Santa Barbara, California, in a depth of 14 meters are documented. The island, which was constructed between 1957 and 1958 to serve as a permanent platform for oil and gas production, is particularly suitable for ecological study. Habitat features associated with the armor rock and concrete tetrapods surrounding the island support a 'microecosystem' which differs in biotic composition from surrounding natural bottom areas. A major part of the study is devoted to analysis of seasonal dynamics in biotic composition. Data analysis indicates that many species exhibit significant variability in abundance from one season to the next. Other studies include a gill net survey of fish fauna, mapping of mussel 'talus' beds at the base of the island, and a survey of biota along a natural bottom transect between the island and shore. In general, the findings indicate a rich and varied fauna and flora associated with the high-relief solid substrate of Rincon Island which differs substantially from the more depauperate natural bottom habitats in the area. (Sinha-OEIS)
W79-02614

VULNERABILITY OF COASTAL ENVIRONMENTS TO OIL SPILL IMPACTS,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5G.
W79-02616

AN OILSPILL RISK ANALYSIS FOR THE MID-ATLANTIC (PROPOSED SALE 49) OUTER CONTINENTAL SHELF LEASE AREA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5G.
W79-02661

THE EFFECT OF HYPOLIMNION RESERVOIR RELEASES ON FISH DISTRIBUTION AND SPECIES DIVERSITY,
Texas Univ. at Austin. Dept. of Zoology.
R. J. Edwards.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p. 71-77, 1978.

Descriptors: *Dams, *Fish populations, Fish physiology, Cold resistance, Hypolimnion, *Reservoirs, *Thermal stratification, Trophic level, Productivity, Impounded water, Impoundments, Sunfishes, Catfishes, Biological communities, Ecosystems, Species diversity.

The fish faunas above and below Canyon Reservoir, Comal County, Texas, were surveyed to determine the effect of the impoundment upon the downstream community. Although 22 species were found above the reservoir, only 18 species were taken in the area downstream from the dam. Comparisons with pre-impoundment surveys of this area, taken a quarter century ago, indicate that seven species, which were once present in the downstream area, are now absent. Species diversity indices demonstrate reduced diversity below the impoundment. Changes in downstream water quality, especially water temperature, due to hypolimnion water releases, seem to be the most likely causal factors associated with this disruption of the natural stream community. (Deal-EIS)
W79-02670

ASSESSMENT AND IMPLEMENTATION OF IN-STREAM VALUE STUDIES FOR THE NORTHERN GREAT PLAINS,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W79-02709

NON-POINT SOURCE WATER QUALITY MONITORING, INYO NATIONAL FOREST, 1975,
California Univ., Los Angeles. Environmental Science and Engineering.
For primary bibliographic entry see Field 5A.
W79-02718

A CONCEPTUAL ECOLOGICAL MODEL FOR CHESAPEAKE BAY,
For primary bibliographic entry see Field 2L.
W79-02746

DEVELOPMENTAL AND ENVIRONMENTAL HISTORY OF THE DISMAL SWAMP,
Indiana Univ. at Bloomington. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-02751

ECOSYSTEMS OF THE WORLD 1: WET COASTAL ECOSYSTEMS.
For primary bibliographic entry see Field 2L.
W79-02762

PLANT AND ANIMAL COMMUNITIES OF PACIFIC NORTH AMERICAN SALT MARSHES,
California Univ., Santa Barbara. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W79-02770

OUTLINES OF ECOLOGY, BOTANY AND FORESTRY OF THE MANGALS OF THE INDIAN SUBCONTINENT,
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de la Carte Internationale du Tapis Vegetal.
For primary bibliographic entry see Field 2L.
W79-02774

WET COASTAL FORMATIONS OF INDO-MALESIA AND PAPUA-NEW GUINEA,
Auckland Univ. (New Zealand), Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02775

EXPLOITATION OF MANGAL,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 2L.
W79-02778

HUMAN USES OF SALT MARSHES,
Maryland Univ., College Park. Chesapeake Research Lab.
For primary bibliographic entry see Field 2L.
W79-02779

ENVIRONMENTAL STUDIES OF KACHEMAK BAY AND LOWER COOK INLET, VOLUME VI: FOOD HABITS OF SHRIMP IN KACHEMAK BAY, ALASKA,
Rutgers - The State Univ., NJ. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-02780

PROBABILISTIC ANALYSIS OF WATER AVAILABILITY IN POWER PLANT SITE SELECTION,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 3E.
W79-02834

SYSTEMATIC ASSESSMENT OF UNCERTAINTIES IN AN ENVIRONMENT IMPACT STATEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources
S. Nnaji, D. R. Davis, and L. Duckstein.
In: Hydrology and Water Resources in Arizona and the Southwest. Proceedings of the 1976 Meetings of American Water Resources Assn. and Arizona Academy of Sciences, Tucson, Arizona, April 1976, p 29-35 (1976). OWRT B-043-ARIZ(9), 14-31-0001-5056.

Descriptors: Forecasting, *Risks, *Evaluation, Reliability evaluation, Systems approach, Colorado River, Salinity Project, *Environmental Impact Statement.

An environmental impact statement (EIS) is meant to be a predictor of the consequences of actions on the environment. However, uncertainties in the statements make it difficult to determine the reliability of the predictions and thus the consequences of the actions. Hence, use of an EIS could be counter-productive if the inherent uncertainties are not recognized and considered in its evaluation. Examination of several EIS's from a systems viewpoint is used to expose the following sources of uncertainty: (1) the identification of the components of the system, (2) the natural uncertainty of the inputs to the system and of the transformation functions producing the output, (3) uncertainties in the modeling of the system due to limitations of sample, economic and technological data. The above viewpoint is used to analyze the Colorado River Salinity Control Project EIS. Uncertainties are identified and classified and means for assessing and incorporating their effect on the environmental impact assessment are discussed.
W79-02882

PRODUCTIVITY OF OSPREYS IN CONNECTICUT-LONG ISLAND INCREASES AS DDE RESIDUE DECLINES,
Cornell Univ. Ithaca, NY. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5C.
W79-02886

MANAGING OIL AND GAS ACTIVITIES IN COASTAL ENVIRONMENTS,
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-02931

7. RESOURCES DATA

7B. Data Acquisition

TECHNIQUES FOR SAMPLING AND ANALYZING THE MARINE MACROBENTHOS,
Corvallis Environmental Research Lab., OR
For primary bibliographic entry see Field 5A.
W79-02627

REMOTE SENSING OF SURFACE SOIL MOISTURE,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center
T. Schmugge.
Journal of Applied Meteorology, Vol. 17, No. 10, p 1549-1557. October 1978. 10 fig, 16 ref.

Descriptors: *Remote sensing, *Soil moisture, *Soil surfaces, Temperature, Thermal radiation, Radar, Microwaves, Diurnal distribution, Evaporation, Soil types, Drying, Aircraft, Correlation analysis, Dielectric properties, Skylab.

The unique thermal and dielectric properties of water afford two possibilities for remotely sensing the moisture content in the surface layer of the soil. Observations of the diurnal range of surface temperature, the microwave brightness temperature (emissivity) and radar backscatter of the soil have shown correlations of up to 0.9 with the moisture in the surface layer (approximately 5 cm thick). The microwave techniques appear to maintain their sensitivity to moisture variations in the presence of a crop canopy. Observations of microwave brightness temperature from satellite platforms have qualitatively confirmed this sensitivity for a wide range of conditions. (Visocky-ISWS)
W79-02682

SATELLITE OBSERVATIONS OF CALCIUM CARBONATE PRECIPITATIONS IN THE GREAT LAKES,
National Environmental Satellite Service, Washington, DC.
A. E. Strong, and B. J. Eadie
Limnology and Oceanography, Vol. 23, No. 5, p 877-887, September 1978. 9 fig, 3 tab, 17 ref

Descriptors: *Remote sensing, *Calcium carbonate, *Great Lakes, Satellites(Artificial), Chemical precipitation, Chemicals, Circulation, Water circulation, Lakes, On-site data collections, Sampling, Data processing, Photography, Limnology, *Whitings.

Reflectance patterns apparently from calcium carbonate ($CaCO_3$) precipitation have been mapped in the Great Lakes using satellite multispectral imagery. The milky water phenomenon ('whiting') occurred regularly in summer and fall during the period studied, 1972-1975, in Lakes Ontario, Erie, and Michigan, but not in Superior and Huron. In situ data provide nearly irrefutable evidence that these whitings are calcareous. They are attributed to supersaturation of $CaCO_3$ during periods of thermal stratification and are most intense in the warmer areas of the lakes. The whitings are maximal several meters below the surface and are undoubtly significant with respect to light transmission, affecting the euphotic zone and thereby photosynthetic production. The whitings may serve as lakewide markers in synoptic analysis of large-scale epilimnial horizontal motions. (Sims-ISWS)
W79-02685

COASTAL WETLANDS: ROLE OF REMOTE SENSING,
Geological Survey, Reston, VA
V. C. Carter.
In: Proceedings of the Symposium on Technical, Environmental, Socioeconomic, and Regulatory Aspects of Coastal Zone Management, American Society of Coastal Engineers, San Francisco, p 1261-1283, March 14-16, 1978. 1 fig, 1 tab, 59 ref.

Descriptors: *Wetlands, *Mapping, *Remote sensing, Census, Surveys, Coastal marshes, Aerial photography, Marsh management.

An overview is presented of the applications of remotely-sensed data to coastal wetlands. In part, technical problems are related to definition and classification; scale, formats, and boundaries, evaluations, mapping methodology, and overlapping responsibility of agencies. Today's operational inventories in coastal states are built on the past decade of research and technology development in remote sensing of wetlands. These inventories and map products utilize aerial photographs as a basic data source and differ in scale, format, minimum mapping unit, classification system, and purpose. The Fish and Wildlife Service is conducting a new national inventory of wetlands which is intended to provide a standardized basis for comparison of wetlands. It too will use available aerial photographs as a basic data source. In the future, satellite data may provide an accurate, reliable, and economical source to update wetland inventories and to monitor or evaluate coastal wetlands. The improvement in technology accompanying the development and launch of LANDSAT C and D and the Space Shuttle promise to make satellite digital data a more powerful tool to supply future management weeds for coastal wetlands. (Steiner-Mass)
W79-02747

APPLICATIONS OF REMOTELY SENSED DATA TO WETLAND STUDIES,
Geological Survey, Reston, VA.
V. Carter.
COSPAR: Space Research Volume XVII. Rycroft, J. J., and Strickland, A. C. (eds.), p 19-23, 1977. 11 ref.

Descriptors: *Wetlands, *Remote sensing, *Mapping, Marsh plants, Aerial photography, Censuses, Satellites, Salt marshes, Fresh water marshes, Distribution patterns.

Remotely sensed data from both aircraft and satellite platforms have been used for a variety of wetland studies. For example, identification of major vegetative associations with LANDSAT digital data made it possible to estimate primary productivity in a Virginia salt marsh. Both seasonal color infrared photographs and LANDSAT digital data are being used for inland wetland investigations. In co-operation with the Tennessee Valley Authority, wetlands in western Tennessee are being classified and mapped at 1:24,000 scale using color infrared photographs which show both boundary dynamics an vegetation. The U.S. Geological Survey and the U.S. Fish and Wildlife Service are using color infrared photographs to aid in a hydrologic study and to map vegetation at 1:24,000 and 1:100,000 scales in the Great Dismal Swamp of Virginia and North Carolina. In each case the base maps are being used to evaluate the accuracy of LANDSAT analyses with the objective of using LANDSAT data for monitoring vegetative change and for updating maps. (Steiner-Mass)
W79-02749

A NEW METHOD FOR COLLECTING WATER SAMPLES FROM BENEATH THE ICE,
Queen's Univ., Kingston (Ontario). Dept. of Geological Sciences.
R. J. Patterson, L. Dykes, S. Frape, R. A. McLeod, and J. Wickens.
Limnology and Oceanography, Vol. 23, No. 5, p 1029, September 1978. 3 ref.

Descriptors: *Sampling, *Water sampling, *Lakes, *Ice, Equipment, Methodology, On-site investigations, Data collections, Limnology, Samplers, Subice water samplers.

A subice sampler was made of a length of tubing which can be tightly sealed at one end by means of a clamp. It was placed open end down through a hole in the ice, pressurized and sealed to maintain the water level below the ice base so that water inside will not freeze, and allowed to freeze in place. Water samples from beneath the ice were collected by releasing the pressure in the tube and withdrawing water with a small hand-operated pump. (Sims-ISWS)
W79-02845

SOLAR MIDDLE ULTRAVIOLET (UV-B) MEASUREMENT IN COASTAL WATERS RICH IN YELLOW SUBSTANCE,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
For primary bibliographic entry see Field 2L.
W79-02849

DEW-MONITORING NETWORK IN THE SOUTHEAST,
National Weather Service, Auburn, AL. Environmental Studies Service Center.
R. R. Getz.
Bulletin of the American Meteorological Society, Vol. 59, No. 9, p 1150-1154, September 1978. 4 fig, 1 tab, 6 ref.

Descriptors: *Dew, *Monitoring, *Alabama, *Georgia, *Florida, *Southeast U.S., Foods, Fibers(Plant), Plant diseases, Diseases, Climatology, Insects, *Dew-monitoring network, Crop harvesting, Duvdevani dew gage, Davis-Hughes wetting system.

A network for monitoring dew in the humid climate of southeasten United States was described. Dew is an important factor in the production of food and fiber and plays a role in the development and spread of many plant diseases, in the activity of insects, and in the application of pesticides. The harvest of major crops in Alabama, Georgia, and Florida, such as peanuts, cotton, and citrus, also are affected by dew. Data were collected from the network each day for use in agricultural weather advisories. Later analysis of the data as recorded on strip charts provided additional detailed information. The design of the instrument system allows for an excellent response to a range of wetness intensities. Nearly all the network stations used a standard bush for the sensor exposure, with the sensors deployed in a similar manner in and near the bush. All dew data were summarized by month and season. (Roberts-ISWS)
W79-02853

THE CALIBRATION OF A PHYTOPLANKTON GROWTH MODEL USING BATCH CULTURE DATA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W79-02878

UN NOUVEL ASPIRATEUR SOUS-MARINS A AIR COMPRIME (A NEW SUBMARINE SUCTION-SAMPLER, USING COMPRESSED AIR),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
C. C. Emig.
Marine Biology, Vol. 43, p 379-380, 1977. 1 fig, 2 ref. (In French with English abstract).

Descriptors: *Research and development, *Sampling, *Design, *Research equipment, Technology, Benthos, Instrumentation, Testing, Equipment, Construction equipment, Methodology, Annual populations.

An automatic submarine auction apparatus for qualitative benthos sampling was described. The sampler was described as being easy to handle. Suction was affected by means of compressed air from cuba diving bottles and was regulated from the surface. Water inlets in the form of 5 small tubes were used to counterbalance the suction effect. 15 kg of lead was used as ballast for the sampler. (EIS-Klein)
W79-02897

AN INEXPENSIVE AND EASILY FABRICATED SAMPLER FOR COLECTING SEDIMENT CORES TO MEASURE EH POTENTIALS,
University of West Floida, pensacola. Faculty of Biology.
G. A. Moshiri, D. P. Brown, and W. G. Crumpton.
Floirda Scientist, Vol. 40, No. 2, p 203-205, 1977.

Descriptors: *Sediments, Estuaries, Sampling, Measurement, *Oxidation-reduction potentials.

Collection of single or multiple cores for the purpose of measuring mud and/or water Eh potentials in estuarine sediments similar to those encountered in northwest Florida estuaries is simplified by new modifications to core design to reduce fabrication costs and facilitate collection and analysis of samples. (Morgan-Florida)
W79-02917

TECHNIQUE FOR COLLECTING FISH WITH A BLOCK NET IN A PUMPED STORAGE RESERVOIR,
Radiation Management Corp., Drumore, PA. Muddy Run Ecological Lab.
P. G. Heisey.
The Progressive Fish Culturist, Vol. 40(4), p 155-157, Oct. 1978. 1 tab, 1 ref.

Descriptors: *Freshwater fish, *Fishing, Fishing gears, Pennsylvania, Nets, On-site investigation, *Methodology, *Block nets, *Susquehanna River, Muddy Run Pumped Storage Pond, Fish harvest, *Fish populations, Ecological distribution, Population composition, Ponds.

A method was developed to sample fish in the Muddy Run Pumped Storage Pond which is located along the Susquehanna River in Southeastern Pennsylvania. More species of fish as well as more individuals were taken more consistently with a block net than with any other gear. (EIS-Katz)
W79-02976

INEXPENSIVE CONSTANT WATER LEVEL DEVICE FOR FLOW-THROUGH AQUARIUMS,
Mississippi State Univ., Mississippi State. Dept. of Biochemistry.
D. L. Garling, Jr., and R. P. Wilson.
The Progressive Fish-Culturist, Vol. 38, No. 1, p 52-53, 1976, 2 fig.

Descriptors: *Design, *Laboratory tests, Research and development, Design criteria, Evaluation, Specifications, Design data, Aquaria, Laboratory equipment, Bioassay, Aquiculture, *Methodology, *Constant water level device, *Flow-through aquaria.

An inexpensive device for maintaining constant water levels in flow-through aquariums, designed and built for use in fish laboratories, was described. The constant-level device consisted of a siphon that emptied water into a reservoir which had a side arm near the top for final water removal to the appropriate drain. The dimensions, materials, and costs of construction were given. (Katz).
W79-02995

7C. Evaluation, Processing and Publication

INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).
American Management Systems, Inc., Arlington, VA.
For primary bibliographic entry see Field 5G
W79-02520

THE DEVELOPMENT OF FLOOD-POTENTIAL INDEX MAPS FOR PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-02598

ANALYSIS OF GRAVITY DATA FROM THE PICACHO BASIN, PINAL COUNTY, ARIZONA,
Arizna Univ., Tucson. Dept. of Geosciences.
F. J. Christie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 139, Price codes: A09 in paper copy, A01 in microfiche. M.S. Thesis, 1978. 105 p, 35 fig, 2 tab, 67 ref. OWRT A-073-ARIZ(1), 14-34-0001-8003.

Descriptors: Groundwate, Geophysics, Subsidence, Data collections, Data analysis, *Gravity surveys, Model studies, *Arizna, Picaho Basin area(Ariz).

A gravity survey was conducted in the Picacho Basin area, located approximately midway between Phoenix and Tucson, Arizona, to define the bedrock surface configuration. Regional gravity effects were removed from the gravity data using a double Fourier series trend surface technique, and the gravity data were modelby using a two-dimensional iterative program. Analysis of both the complete Bouguer and residual gravity anomaly maps indicates that the Picacho Basin is a north-south trending graben-like structure with significant pediment development beneath as much as 2000 feet of alluvium. The maximum basin depth is nearly 15,600 feet. A thick (as much as 6000 feet) and extensive body of massive anhydrite lies situated between buried basin faults scarps that sometimes are in excess of 10,000 feet in vertical extent. Modeling also reveals an apparent strong correlation between modeled buried bedrock surface irregularities (generaly recognized as scarps and ridges) and the location of earth fissures near the basin periphery. Of the peripheral earth fissures crossed by profiles lines, 83% could be correlated within + or - 1/2 mile to a modeled bedrock surface irregularity.
W79-02599

SELECTED HYDROLOGIC DATA, 1931-77, WASATCH PLATEAU-BOOK CLIFFS COAL-FIELDS AREA, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
K. M. Waddell, H. L. Vickers, and P. K. Contratto.
Open-file report 78-121, 1978. 33 p, 2 fig, 1 plate, 14 tab, 4 ref.

Descriptors: *Water quality, Effects, *Coal mines, *Surface waters, *Groundwater, Data collections, Streamflow, Discharge(Water), Springs, Water wells, Water levels, Drillers logs, Water analysis, Chemical analysis, Streambeds, Utah, *Wasatch Plateau-Book Cliffs coal-fields area.

The Wasatch Plateau-Book Cliffs coal-fields area in east-central Utah includes a significant part of the State's coal resources and is currently (1977) the most active coalmining area in the State. Data gathered by the U.S. Geological Survey are presented as part of a hydrologic reconnaissance in cooperation with the U.S. Bureau of Land Management during the period July 1975-September 1977 as well as selected data for the period 1931-75. Also included are selected data collected by private, State, and other Federal agencies. Types of data include water-level records, logs of selected wells, discharge of springs, wells, and mines, gaged and estimated streamflow, chemical analyses of water from springs, wells, mines, and streams, and laboratory analyses of streambed material and formation samples. The report is intended to make data available to those assessing the water resources that may be affected by coal-mining activities in the Wasatch Plateau-Book Cliffs coal-field are. (Woodard-USGS)
W79-02645

HYDROLOGIC DATA FOR URBAN STORM RUNOFF FROM THREE LOCALITIES IN THE DENVER METROPOLITAN AREA, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
S. R. Ellis.
Available from OFSS, Branch of Distribution, USGS, Box 25425, Fed. Ctr. Denver, CO 80225, microfiche $4.50 pc $28. Open-file report 78-410, May 1978. 135 p, 4 fig, 3 plates, 59 tab, 6 ref.

Descriptors: *Urban runoff, *Storm runoff, *Water quality, *Path of pollutants, *Watershed management, Hydrologic data, Rainfall-runoff relationships, Snowmelt, Water analysis, Chemical analysis, Dissolved solids, Trace elements, Nutrients, Biochemical oxygen demand, Coliforms, Pesticides, *Colorado, *Denver area(Colo).

Urban storm-runoff data, collected from 1975 to 1977, on three catchment areas in the Denver, Colo., metropolitan area are presented. The catchment are predominantly a single-family residential catchment area in Littleton, a multifamily residential and commercial catchment area in Lakewood, and a high-density residential and commercial catchment area in Denver. Precipitation, rainfall-runoff, snowmelt-runoff, water-quality (common constituents, nutrients, biochemical oxygen demand, coliform bacteria, and solids, trace elements, and pesticides), and catchment-area data are necessary to use the U.S. Environmental Protection Agency's Storm Water Management Model II. The urban storm-runoff data may be used by planning, water-management, and environmental-protection agencies to assess the impact of urban storm runoff on the hydrologic system. (Woodard-USGS)
W79-02646

WATER WELLS AND SPRINGS IN PALO VERDE VALLEY, RIVERSIDE AND IMPERIAL COUNTIES, CALIFORNIA,
Geological Survey, Laguna Niguel, Water Resources Div.
W. R. Moyle, Jr., and M. J. Mermod
Available from State of California Water Res. P. O. Box 388, Sacramento, CA 95802, price $5.00. California Department of Water Resources, Sacramento, Bulletin 91-23, October 1978. 361 p, 1 fig, 6 tab, 12 ref.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Aquifer characteristics, *Water quality, Chemical analysis, Well data, Water utilization, Water level fluctuations, Geology, Maps, Sampling, Sites, California, *Palo Verde Valley, *Riverside County, *Imperial County.

This report lists ground-water data and shows the geologic mapping for Palo Verde Valley, California. The tables include: a description of wells and one spring, water levels, chemical analyses of water, public water-supply criteria, and results of pumping tests of wells. Maps show the geology and locations of the wells and spring. (Woodard-USGS)
W79-02647

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
Water-Data Report OK-77-2, September 1978. 235 p, 8 fig.

Descriptors: *Oklahoma, *Hydrologic data, *Surface waters, *Groundwate, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Red River basin.

Water resources data for the 1977 water year for Oklahoma consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes or reservoirs. Volumes 1 and 2 of this report contain discharge records for 112 gaging stations; stage and contents for 22 lakes or reservoirs; water quality for 95 gaging stations, 3 lakes, and 8 wells; and water levels for 49 wells. Also included are 41 crest-stage partial-record stations and 1 low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the national Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oklahoma. This report (volume 2) includes the Red River basin. (Woodard-USGS)
W79-02665

WATER RESOURCES DATA FOR ARKANSAS, WATER YEAR 1977.
Geological Survey, Little Rock, AR. Water Resources Div.
Water-Data Report AR-77-1, August 1978. 650 p, 5 fig, 3 tab.

Descriptors: *Arkansas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for Arkansas consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. This report contains discharge records for 70 gaging stations; stage only records for 1 gaging station; stage and contents for 13 lakes and reservoirs; water quality for 136 stations, 69 partial-record flow stations, and 7 lakes; and water levels for 82 observation wells. Also included are 119 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Arkansas. (Woodard-USGS)
W79-02666

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1977--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City. OK. Water Resources Div
Water-Data Report OK-77-1, September 1978. 543 p, 8 fig.

Descriptors: *Oklahoma, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Arkansas River basin.

Water resources data for the 1977 water year for Oklahoma consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes or reservoirs. Volume 1 and 2 of this report contain discharge records for 112 gaging stations; stage and contents for 22 lakes or reservoirs; water quality for 95 gaging stations, 3 lakes, and 8 wells; and water levels for 49 wells. Also included are 41 crest-stage partial-record stations and low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oklahoma. This report (volume 1) includes the Arkansas River basin. (Woodard-USGS)
W79-02667

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1977.
Geological Survey, Charleston, WV. Water Resources Div
Water-Data Report WV-77-1, September 1978. 289 p, 4 fig.

Descriptors: *West Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment

transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levles, Data collections, Sites.

Water resources data for the 1977 water year for West Virginia consist of records of stage, discharge, and water quality of streams and springs; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 129 gaging stations, stage only records for 2 gaging stations, stage and contents for 7 lakes and reservoirs, contents for 1 reservoir, water quality for 43 gaging stations, and water levels for 36 observation wells. Also included are 35 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in West Virginia. (Woodard-USGS)
W79-02668

WATER WETLANDS, AND WOOD STORKS IN SOUTHWEST FLORIDA,
Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 2H.
W79-02677

WHAT THE DESIGN ENGINEER NEEDS FROM THE HYDROMETEOROLOGIST,
CH2M Hill, San Francisco, CA.
W. P. Henry, and J. J. Cassidy.
Journal of Applied Meteorology, Vol. 17, No. 10, p 1558-1563, October 1978. 9 ref.

Descriptors: *Design data, *Hydrologic data, *Meteorological data, Data processing, Analytical techniques, Construction, Hydraulic structures, Projects, Engineering, Design storm, Scheduling, Planning, Safety, Data, Weather data, Rainfall, Runoff, Water yield, Dams, Structures, Civil engineering, Meteorology, Hydrology, *Data requirements.

The water resources engineer is faced with three major types of problems when designing projects: (1) determination of project yield, (2) determination of project safety, and (3) determination of project scheduling. Hydrometeorology plays an important role in solving each type of problem. The most urgent needs the design engineer has for the expertise of the hydrometeorologist were identified and described. In addition, publications regularly read by design engineers were listed so that the hydrometeorologist can effectively communicate his information to the practicing engineer. (Sims-ISWS)
W79-02683

ENVIRONMENTAL PARAMETERS OF THE TENNESSEE RIVER IN ALABAMA: II. PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS,
Alabama Univ., in Huntsville. School of Graduate Studies and Research.
For primary bibliographic entry see Field 5A.
W79-02781

APPLICATION OF COMPUTER WAVEFORM MATCHING TO MONITORING OF HYDROLOGIC SYSTEM PARAMETERS,
Nebraska Univ., Lincoln.
P. Chao-Hsing.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 432, Price codes: A06 in paper copy, A01 in microfiche. Ph.D Dissertation, July 1977. 110 p, 20 fig, 16 tab, 37 ref. OWRT B-031-NEB(1), 14-31-0001-5088.

Descriptors: Computers, *Optimization, *Streamflow simulators, *Modeling studies, *Simulation analysis, Monitoring, Mapping, Algorithms, Watershed models, *Waveform matching method.

A new waveform mapping approach to optimization of parameters in a streamflow simulator based on a distributed hydrologic system model has been designed, described and applied. Assuming initial values, the model parameters for the simulator are adjusted using information obtained from waveform-mapped comparisons of observed and predicted hydrographs. Optimization of the simulation parameters is performed by a two-dimensional transformation and regression technique which yields values of mapping parameters that provide the feedback information used for adjusting the model parameters. The algorithm has been tested both independently and in conjunction with watershed streamflow simulators. The results of these tests indicate the success of the original waveform matching method designed for parameter optimization in streamflow simulators.
W79-02836

CHARACTERISTICS AND FILTERING OF NOISE IN LINEAR HYDROLOGICAL SYSTEMS,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
J. W. Delleur, and R. A. Rao.
In: Proceedings of Warsaw Symposium-Mathematical Models in Hydrology, July 1971, IAHS-AISH Publ. No. 101, p 570-579, 1974. 5 fig, 15 ref. OWRT-B-022-IND(5).

Descriptors: *Hydrologic systems, *Rainfall, *Runoff, Rainfall-runoff relationships, Fourier analysis, *Linear systems, Computational noise, *Digitization noise, Transfer functions, Filtered data.

The identification and fitting of a linear model of the short-range rainfall-runoff transformation are affected by the presence of noise generated by the computational procedure and by errors in the data. The digitization and computational noise is analysed by means of the Fourier amplitude spectra of the input and of the output. The effect of this noise may be reduced by judicious choice of the digitization step and of the truncation limits of the integrations in the transform domain. The rainfall data are usually more contaminated by noise due to error than the runoff data. The noise attributed to the rainfall data is estimated and its probability distribution and spectrum are then obtained. The error noise may be controlled by digital filtering. The effectiveness of the filters is shown by comparing the rainfall noise spectra obtained from filtered and unfiltered data.
W79-02914

GLACIER SURVEYS IN ALBERTA - 1975,
Department of Fisheries and Environment, Ottawa (Ontario). Water Resources Directorate.
For primary bibliographic entry see Field 2C.
W79-02925

8. ENGINEERING WORKS

8A. Structures

DEVELOPMENT OF A HIGH PRECISION CAPABILITY FOR MONITORING STRUCTURAL MOVEMENTS OF LOCKS AND DAMS,
Army Engineer Topographic Lab., Fort Belvoir, VA. Research Inst.
K. D. Robertson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 078, Price codes: A04 in paper copy, A01 in microfiche. Report ETL-0121, September 1977. 69 p, 6 fig, 16 tab, 2 ref, 4 append

Descriptors: *Surveys, *Surveying instruments, *Dams, *Locks, Movement, Deformation, Safety, Stability, Structures, Structural stability, Hydraulic structures, On-site investigations, Measurement, Engineering, Civil engineering, Precise surveying, Dam deformation, Trilateration.

A program of periodic inspection and continuing evaluation is required to insure the safety of many civil works structures. This report documented a Corps of Engineers program to develop a capability within the various Engineer districts for making very high precision survey measurements of structures. The program consists of measurements of several structures and of training programs for survey personnel. Results of the measurements were included. (Sims-ISWS)
W79-02708

CENTRIFUGE MODELLING STUDIES ASSOCIATED WITH DESIGN AND CONSTRUCTION OF EARTH DAMS,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
For primary bibliographic entry see Field 8D.
W79-02857

CAPACITY STUDIES OF WINFIELD LOCKS, KANAWHA RIVER, WEST VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W79-02858

DUG-WELLS, DUG-CUM-BORE WELLS, AND TUBEWELLS,
Central Groundwater Board, Nagpur (India).
For primary bibliographic entry see Field 4B.
W79-02994

8B. Hydraulics

UNSTEADY STREAMFLOW SIMULATION USING A LINEAR IMPLICIT FINITE-DIFFERENCE MODEL,
Geological Survey, NSTL Station, MS. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02644

WHAT THE DESIGN ENGINEER NEEDS FROM THE HYDROMETEOROLOGIST,
CH2M Hill, San Francisco, CA.
For primary bibliographic entry see Field 7C.
W79-02683

SUSPENDED SEDIMENT AND BED MATERIAL STUDIES ON THE LOWER MISSISSIPPI RIVER,
Army Engineer District, Vicksburg, MS. Potamology Section.
L. G. Robbins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 285, Price codes: A10 in paper copy, A01 in microfiche. Report 300-1, August 1977. 227 p, 69 fig, 17 tab, 20 ref, 6 plate, 12 photo, 5 append.

Descriptors: *Potamology, *Mississippi River, *Sediments, *Data collections, Suspended solids, River beds, River basins, On-site data collections, Rivers, Alluvial channels, Sediment yield, Sediment discharge, Sampling, Particle size, Bed load samples, Discharge(Water), Suspended load, Flow characteristics, Roughness(Hydraulic), Roughness coefficient.

The ultimate purpose of sediment studies in the Army Engineer District, Vicksburg, is to develop a workable knowledge of the basic principles controlling the transport of sediment in the Lower Mississippi River and to apply this knowledge toward effective and economical stabilization works for flood control and navigation. The more immediate purpose of this report, however, was to present the data that have been collected and analyzed to date (1929-1974) and to show what trends exist in the quantities and sizes of suspended and bed sediments for the Vicksburg District. For this report, measurements of all available bed-material samples were presented, but presentation of suspended sediment measurements was limited to data collected at the 3 main discharge ranges since data at these ranges have been collected at regular.

frequent intervals. Some analysis of the data was made, but no theoretical aspects of sediment transport were presented. The information presented in the tables and graphs of this report may be considered as a step toward the realization of the ultimate purpose of sediment studies in the Lower Mississippi River. (Humphreys-ISWS)
W79-02703

HYDRAULICS AND DYNAMICS OF NEW CORPUS CHRISTI PASS, TEXAS: A CASE HISTORY, 1972-73,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
E. W. Behrens, R. L. Watson, and C. Mason.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 472, Price codes: A07 in paper copy, A01 in microfiche. Army Coastal Engineering Research Center, Fort Belvoir, VA. GITI Report 8, Jan 1977. 126 p, 74 fig, 10 tab, 46 ref, 5 append. DACW72-72-C-0026, DACW72-72 C-0027.

Descriptors: *Inlets(Waterways), *Sediment transport, *Tidal waters, *Texas, *Gulf of Mexico, Beaches, Sediments, Sands, Tides, Waves(Water), Ocean waves, Sedimentation, Erosion, Hydraulics, *Corpus Christi Pass(Texas), Tidal inlets, Tidal currents.

In 1972, a 2-mile channel was dredged through Mustang Island, Texas, to increase water exchange and fish migration between Corpus Christi Bay and the Gulf of Mexico. The pass' initial adjustment to tides, waves, and other forces was measured the first year following the opening. Hydraulic and sedimentary effects of the pass were studied by obtaining detailed bathymetric, topographic, and hydraulic surveys of the pass and adjacent gulf beaches; daily wave observations provided information on the seasonal variability in wave height, period, and direction. An estimated 1 million cubic yards of sand accumulated at the pass during construction of two gulf jetties. Thereafter, a loss of sand greater than the estimated net annual longshore transport rate occurred on beaches south (downdrift) of the jetties. Considerable sediment was deposited on shoals at the bay end of the pass with little accumulation in the pass. Hydraulic measurements indicated that channel frictional resistance increased by about 50% over the study period; although greater variability occurred during individual tidal cycles. Tidal discharges through the pass was highly dependent upon variations in the gulf tides, with equal volumes of ebb and flood flows during diurnal tides and strong flood predominance during mixed and semidiurnal cycles. The average discharge through the pass was only about 3% of the total tidal prism of Corpus Christs Bay, indicating that the bay tides, which partly control flow through the pass, result primarily from passage of the tide through Aransas Pass, the major bay-gulf connection. The pass was marginally stable during the first year, but the wide range of climatic conditions in the region probably will cause the pass to be stable in some years and unstable in others. Although the pass undoubtedly influences bay water within the immediate vicinity, no significant effect on flushing of Corpus Christi Bay resulted from the pass construction. (Sims-ISWS)
W79-02707

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer District, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W79-02717

CAPACITY STUDIES OF WINFIELD LOCKS, KANAWHA RIVER, WEST VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
L. L. Daggett, and R. W. McCarley.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 382, Price codes: A06 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-1, February 1977. 95 p, 16 fig, 17 tab, 2 ref, 5 append.

Descriptors: *Locks, *Navigation, *Inland waterways, *West Virginia, Rivers, Barges, Hydraulic structures, Model studies, Mathematical models, Simulation analysis, Evaluation, *Kanawha River(WV), River traffic, Facility capacity.

The Winfield lockage facilities, located near Winfield, West Virginia, currently consist of two 360-ft x 56-ft chambers with a normal lift of 28 ft. With the increasing traffic on the Kanawha River, these facilities Are no longer adequate to serve the towing industry using this portion of the inland waterway system. Excessive delays now occur at Winfield, and if the predicted traffic growth materializes during the next 10 or 15 years without action being taken to address the problem, transfers of traffic movements to other more costly modes of transportation will result. Accordingly, studies were conducted to determine the capacity of the existing lockage facilities and to evaluate possible solutions for increasing this capacity through the use of alternative operating policies and rules that have been beneficial at other lock sites. Using two simulation models, four alternative operating policies were simulated to determine their respective effects on the capacity of the Winfield locks and the delays to be expected should such policies be possible. (Sims-ISWS)
W79-02858

THE OXFORD UNIVERSITY WATER CAVITATION TUNNEL. DESCRIPTION AND OPERATING PROCEDURES,
Oxford Univ. (England). Dept. of Engineering Science.
A. B. Bailey.
Report No. 1083/74, 1974. 26 p, 9 fig.

Descriptors: *Cavitation, *Tunnel hydraulics, *Research facilities, Research facilities, Research equipment, Instrumentation, Equipment, Laboratory equipment, Tunnel pressure, Laboratory tests, Pumps, Flow, Hydraulics, Water circulation, Tunnels, Cavitation tunnels.

The Oxford University water cavitation tunnel, like all tunnels for cavitation studies, comprises a closed hydraulic circuit with means for both circulating the water at pre-selected speeds past the test body and for controlling the mean ambient pressure around the body. This provides control over both the Reynolds number and the tendency to cavitate (cavitation number). The tunnel is unusual in that a diffuser for energy recovery is not fitted downstream of the test section; this arises due to its original configuration as a free jet tunnel. While the absence of a diffuser renders the tunnel relatively uneconomical in running power consumption, the tunnel does have the advantage of removing any restriction on the choice of test section configuration. (Sims-ISWS)
W79-02860

EXPERIMENTS ON THE STRUCTURE OF TURBULENT SHEAR IN PIPE FLOWS OF WATER
Florida Univ., Gainesville. Dept. of Engineering Sciences.
R. R. Johnson, R. F. Elkins, E. R. Lindgren, and J. K. Yoo
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 237, Price codes: A02 in paper copy, A01 in microfiche. The Physics of Fluids, Vol. 19, No. 9, p 1422-1423, September 1976. 4 fig, 7 ref. ONR N00014-75-C-1090, NSF ENG75-03470.

Descriptors: *Pipe flow, *Turbulent flow, *Laboratory tests, Instrumentation, Equipment, Photography, Data processing, Velocity, Turbulence, Tracers, Hydraulics.

A tracer particle method by which three-dimensional turbulent velocity fields can be pictured in great detail, both qualitatively and quantitatively, was described. (Sims-ISWS)
W79-02874

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS. SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Lab., Delft (Netherlands) and Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
For primary bibliographic entry see Field 2L.
W79-02983

DEVELOPMENT OF CAVITY TYPE TUBEWELLS,
Indian Inst. of Tech., Kharagpur.
B. Anjaneyulu, A. C. Pandya, and A. P. Mishra.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol. 2, p III-87-III-94, 2 fig, 1 tab, 6 ref.

Descriptors: *Artesian aquifers, *Wells, Groundwater, Drilling, Inflow, Application methods, Drill holes, *Tube wells, *Cavity wells, Confined aquifers.

Cavity wells are a special type of tubewells constructed in confined aquifers. The well boring is carried to the surface of the water bearing stratum and some small amount of sand is taken out with a sand boiler, crating an initial cavity. This cavity is further enlarged by pumping water at a high rate. The movement of the sand particles begins only when the drawdown is equal to the critical drawdown. This value is dependent on the properties of the aquifer material, such as mass and cohesiveness, and the radius of the initial cavity. It is, however, independent of the aquifer thickness. The mathematical development of these forces is presented. (Bradbeer-NWWA)
W79-03000

8D. Soil Mechanics

SPECIFIC FEATURES OF CONSTRUCTION OF THAWED SOIL DAMS IN SEVERE CLIMATE CONDITIONS,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
G. F. Bianov, and L. I. Kudoyarov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 672, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 660, November 1977. 15 p, 2 fig, 2 ref. Translated from Soviet-American Working Seminar 'Technology of Construction of Structures under Cold-Climate Conditions', Moscow (USSR), p 16-28, May 1977.

Descriptors: *Earth dams, *Cold weather construction, *Permafrost, *Dam construction, Dams, Cold regions, Frozen soils, Thawing, Stability, Foreign research, Temperature, Dam foundations, Structures, Hydraulic structures, Engineering, Civil engineering, *USSR.

Thawed dams, which allow thawing of frozen soils in the foundation during operation, can be built, provided the deformations in the foundation due to thawing and thermal settling do not result in a loss of the stability of the structure. Development and implementation of a set of measures will make it possible to build dams out of binding soils in the Far North at temperatures down to -40 to -45C and to eliminate completely the seasonal nature of construction work. The dumping of excess water during construction over the crest of an uncompleted dam will make it possible to reduce the cost of building expensive temporary water diversion structures. (Sims-ISWS)
W79-02693

THERMAL REGIME OF EARTH-ROCK DAMS CONSTRUCTED IN THE FAR NORTH,
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidrotekhniki, Leningrad (USSR)
Sh. N. Plyat, N. A. Mukhetdinov, and E. A. Smirnov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 538, Price codes: A02 in paper copy, A01 in microfiche

CRREL Draft Translation 658, November 1977. 14 p, 4 fig. Translated from Proceedings of the Soviet-American Working Seminar 'Technology of Construction of Structures Under Cold Conditions,' held May 25-26, 1977 at Leningrad (USSR). 14 p.

Descriptors: *Earth dams, *Rockfill dams, *Permafrost, *Cold weather construction, Model studies, Mathematical models, On-site investigations, Dams, Cold regions, Temperature, Measurement, Heat transfer, Freezing, Thawing, Civil engineering, *USSR.

The earth-rock dam predominates under Far North conditions because it is the most efficient and economical type of dam for handling medium and high heads. Hydraulic engineering construction practice has required scientific mastery of many problems which have arisen in designing earth-fill, high-head dams in the northern construction climate zone of the USSR. One question, whose solution is of primary importance for the development of economically efficient construction of earth dams and the technology for their exploitation, involves predicting and controlling the thermal regime of earth-rock dams during construction and operation. This report described methods developed to calculate the thermal regime of earth dams, along with data from field observations of such structures. (Sims-ISWS)
W79-02694

FUNDAMENTALS OF CONSTRUCTING FROZEN TYPE EARTH DAMS IN THE ARCTIC,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
G. F. Biianov, G. F. Maslovskiy, and L. N. Toropov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 130, Price codes: A02 in paper copy, A01 in microfiche. CRREL Translation 651, October 1977. 14 p, 6 fig, 2 ref. May 1977. 16 p.

Descriptors: *Earth dams, *Cold weather construction, *Permafrost, *Frozen soils, Freezing, Soils, Dams, Spillways, Structures, Hydraulic structures, Construction, Cold regions, Ice, Heat transfer, Engineering, Civil engineering, *USSR, *Frozen type dams.

Available experience makes it possible to determine the main trends for improving the designs, methods, and techniques of erecting frozen and thawed dams from soil materials and also makes it possible to make some conclusions: (1) Frozen-type dams may be erected on weak, ice-saturated, frozen soils if dependable, frozen, antifiltration screens in the body of the dam are provided and are joined with the frozen soils of the base. (2) The design of the dam may be different, depending on the organization of work to erect the dam and to create the frozen screen. If the freezing system is installed prior to the beginning of constructing the dam and the frozen screen is created simultaneously with erection of the dam, the tuckstone of the argillaceous core may be eliminated as a structural member. (3) When work in erecting dams is organized with simultaneous installation of the frozen screen, it is possible to use local frozen water or clay mortars. The core of these dams may be erected by building up or pouring soil into the water. (4) The use of water-soluble heat carriers (brines) is not permitted to freeze the soils of the dam core since they thin the frozen soil in case of leaks. (Sims-ISWS)
W79-02695

EVALUATION OF STABILITY OF EARTH-FILL DAM BASED ON STRENGTH OF FROZEN ZONES OF ITS PROFILE,
G. I. Kuznetsov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 255, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 628 July 1977. 6 p, 2 fig. Translated from Russian.

Descriptors: *Dams, *Earth dams, *Permafrost, *Cold weather construction, Freezing, Thawing, Cold regions, Soils, Frozen soils, Soil properties, Soil physical properties, Soil physics, Reservoirs, Stress, Hydrostatic pressure, Infiltration, Soil water movement.

When planning a permafrost dam, it is necessary to consider that the freezing of its lower wedge due to natural cooling of the surface of the lower slopes and the transfer of cold from the permafrost curtain may take 3 to 4 years if the soil is not allowed to freeze layer by layer during the filling process. This report discussed the strength and stability of earth filled dams based on durability of frozen zones of its profile. (Sims-ISWS)
W79-02696

STUDIES OF NONSTATIONARY TEMPERATURE REGIME OF FROZEN DAMS MADE OF LOCAL MATERIALS ON PERMAFROST FOUNDATIONS.
N. V. Ukhova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 601, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 665, November 1977. 22 p, 1 fig, 4 ref. Translated from the author's abstract of a dissertation in defense of the degree of candidate in technical sciences, 1967. 18 p.

Descriptors: *Dams, *Permafrost, *Ice, *Temperature, Thermal properties, Rockfill dams, Earth dams, Thawing, Freezing, Structures, Hydraulic structures, Construction, Cold regions, Cold weather construction, *USSR, Frozen dams.

The specific characteristics of hydraulic engineering construction on permafrost foundations under harsh climatic conditions result in a situation in which the most economic type of dam in the regions is the type made of local materials. A distinction can be made between two methods of constructing dams from local materials on permafrost foundations: the 'warm' method, used when construction takes place primarily during the summertime by usual methods, and usually encountered in regions with moderate climates; and 'cold,' when construction takes place in winter with stratified freezing of the entire dam or its individual elements, or in summer, with subsequent freezing of the structure. The frozen part of the dam is intended to make it impermeable to water. Reliable operation of partly or completely frozen dams is determined by the temperature regime of the construction and the foundation, which must be such that the frozen 'curtain' in the dam does not thaw out during the latter's operation. The dissertation was devoted to an analytical experimental study of the nonstationary temperature regime of frozen dams made of local materials on permafrost foundations, and reported on one aspect of the problem of construction of dams on permafrost foundations. (Sims-ISWS)
W79-02698

INVESTIGATION OF SLUMPING FAILURE IN AN EARTH DAM ABUTMENT AT KOTZEBUE, ALASKA,
Cold Regions Research and Engineering Lab., Fairbanks, AK. Alaskan Projects Office.
C. M. Collins, and T. T. McFadden.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 306, Price codes: A03 in paper copy, A01 in microfiche. Special Report 77-21, July 1977. 25 p, 26 fig, 1 tab, 5 ref, 2 append. Pub. Health Serv. 243-76-0206.

Descriptors: *Earth dams, *Dam failure, *Permafrost, *Cold weather construction, *Alaska, On-site investigations, Thawing, Freezing, Dams, Drill holes, Drillers logs, Thermal properties, Measurements, Slope stability, Slope stabilization, Cold regions, Civil engineering, *Kotzebue(Alaska), Slumping failure.

A slumping failure on the upstream side in one area of the water supply reservoir at Kotzebue, Alaska, was investigated. Seven 80-ft (24.4-m) thermocouple strings were emplaced in the dam abutment, and an additional four thermocouple strings were installed behind the dam, extending to a depth of 95 ft (28.9 m) below the bottom of the reservoir. All thermocouples indicated below freezing temperatures at their respective positions. These measurements combined with the drill logs indicated that neither the dam nor the abutment is in immediate danger of failure, but that steps must be taken to stop the sloughing of material in the abutment area. Recommendations were given to accomplish this. (Sims-ISWS)
W79-02702

ANALYTICAL COMPUTATION OF THE THREE-DIMENSIONAL STEADY-STATE TEMPERATURE CONDITION OF A DAM,
P. A. Bogoslovskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 655, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 601, Feb 1977. 9 p, 2 fig, 6 ref. p 24-30, 1970.

Descriptors: *Earth dams, *Permafrost, *Temperature, *Model studies, Mathematical models, Heat transfer, Frozen soils, Freezing, Thawing, Reservoirs, Dams, Cold regions, Cold weather construction, Structures, Hydraulic structures, Analytical techniques, Engineering, Civil engineering, *USSR.

Temperature conditions are of very great significance for earth darns based on permafrost ground. One of the indices of the temperature condition of nonfiltering earth dams on a permafrost base is the steady-state (temporally invariable) temperature distribution for mean annual conditions, that is, for the mean water level in the reservoir, and the mean temperature readings at ground level. Tasks such as these were reviewed for two-dimensional conditions on the assumption of a very broad river valley compared with the cross sectional dimensions of the dam. But consideration also must be given to three-dimensional conditions, where dams abut the sides of valleys, for example, in order to evaluate the cooling influence of the sides of a valley, and other factors, in order to solve engineering problems. These questions ordinarily are elucidated by electrothermal analogy testing of models. These factors are the reason for seeking an analytical solution to the three-dimensional problems of the steady-state temperature field. (Sims-ISWS)
W79-02856

CENTRIFUGE MODELLING STUDIES ASSOCIATED WITH DESIGN AND CONSTRUCTION OF EARTH DAMS,
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
V. I. Shcherbina.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 129, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 650, October 1977. 17 p, 7 fig, 7 ref. Moscow (USSR), May 1977. 18 p.

Many problems that arise during construction and design of earth hydroengineering complexes, such as estimating the bearing capacity of an inhomogeneous base, determining the lateral pressure of the soil, determining the criterion of crack formation in the cores of dams, estimating the stability of the slopes of structures, cannot be resolved confidently when conducting ordinary model experiments with full-scale soils. The main reason for this is that the stresses due to the natural weight in the models are considerably less than those in real structures: at the same time, as shown previously, the deformation and strength properties of soils under small and large stresses may differ considerably, and not only quantitatively but qualitatively as well. To overcome this difficulty permits the use of the centrifuge modelling method in investigations, the main advantage of which is the possibility of investigating relatively small models made of full-scale soil under stresses similar to full-scale in absolute value and by the nature of distribution. This report went into detail concerning this modelling technique. (Sims-ISWS)

W79-02857

SILT SAMPLING STUDY, BONNEVILLE SPILLWAY DAM, BONNEVILLE, OREGON.
Army Engineer Div. North Pacific, Bonneville, OR.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 304, Price codes: A02 in paper copy, A01 in microfiche. Report No. 14-1, January 15, 1944. 20 p, 4 fig, 1 tab.

Descriptors: *Suspended solids, *Columbia River, *Bonneville Dam, Sediments, Silts, Quartz, Calcite, Diatoms, Clays, Sampling, Analysis techniques, Data processing, Seasonal, Erosion, Dams, Spillways.

The purpose of the study was to determine, over a period of one year (1 April 1942 to 31 March 1943), the amount and character of the suspended material carried by the Columbia River at Bonneville Spillway Dam. The results of the study were: (1) The amount of suspended material carried by the Columbia River varied from a maximum of 638 p.p.m. to a minimum of 10 p.p.m. during the year of sampling; the average for the period was 76 p.p.m. (2) Petrographic and x-ray examinations of the suspended material showed the presence of varying amounts of quartz, calcite, diatoms, volcanic ash, clay minerals, and feldspar; quartz being the only one occurring in hard angular grains. (3) The fineness analyses of the silt indicated a fairly uniform size distribution for the year of sampling. (Sims-ISWS)
W79-02861

DAM OF THE ANADYRSK THERMAL ELECTRIC POWER STATION,
A. L. Kuznetsov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 359, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 659, November 1977. 18 p, 6 fig, Translated from Trudy Gidroproyekta, No. 34, p 83-100, 1973.

Descriptors: *Earth dams, *Cold weather construction, *Permafrost, *Dam construction, Cold regions, Dams, Construction, Design, Dam design, Soils, Frozen soils, Structures, Hydraulic structures, Weather, Foreign countries, Foreign research, Temperature, Engineering, Civil engineering, *USSR.

In 1964, a dam was constructed to supply water to the city of Anadyr' on the Chukotka Peninsula. The dam is 8.5 m high and 410 m long, and it impounds a reservoir with a volume of about 1 million cu m. It is planned to increase the reservoir capacity nearly seven-fold to meet the increasing requirements of the city and the thermal electric power station under construction. A dam 16 m high (24 m including the toe) and a crest 1,500 m long will be required. The existing dam will be incorporated as the upper wedge of the new dam. The dam will be constructed in a permafrost area with severe climate and harsh engineering and geological conditions. This will be one of the largest dams built on friable permafrost sediment which settles after the soil thaws. The installation will include a dam, self-regulating spillway, and a stilling basin with pump. (Sims-ISWS)
W79-02862

CRYOPEDOLOGICAL RESEARCH IN THE CONSTRUCTION OF DAMS UNDER SEVERE CLIMATIC CONDITIONS,
Kuybyshevskii Inzhenero-Stroitelnyi Inst. (USSR). Dept. of Hydraulic Engineering.
N. A. Tsytovich, and Ya. A. Kronik.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 656, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 602, Feb 1977. 15 p, 2 fig, 19 ref. Translated from Sbornik trudov po gidrotekhnike i gidrostroitel'stva pri stroitel'stve plotin v surovykh klimaticheskikh usloviyak, Moscow (USSR), 1970.

Descriptors: *Cold weather construction, *Dams, *Earth dams, Soils, Freezing, Frost, Permafrost, Frozen soils, Heaving, Frost heaving, Frost action, Structures, Hydraulic structures, Construction, Cold regions, Engineering, Civil engineering, *USSR.

This article reviewed some of the initial results of complex cryopedological research based on the physicochemistry, physics, and mechanics of frozen soils. This research included: study of the problem of frost heave of soils, as applicable to hydraulic engineering practice and the development of the corresponding antiheave measures; study of questions concerned with heat and moisture transfer and temperature deformations; study of the processes involved in structure formation in frozen and thawing soils; development of methods for conducting field and laboratory cryopedological research and design of the corresponding instruments and meters; development of frost danger (heave-ability) and frost resistance of soils used in hydraulic engineering construction and the procedures to use to find these values; full-scale observations of temperature regimes and dam behavior; and the development of the thermal and physical bases for the preparation, storage, and winter placement of cohesive soils in qualitative hydraulic engineering embankments. (Sims-ISWS)
W79-02867

DAM DESIGN AND CONSTRUCTION IN THE USSR'S NORTH AND SIBERIA,
All-Union Designing, Surveying and Scientific Research Inst., Hydroproject, Leningrad (USSR).
L. K. Domansky, L. I. Kudoyarov, and V. G. Radchenko.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-044 747, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 646, September 1977. 14 p, 9 fig, 10 ref. Translated from Soviet-American Working Seminar Technology of Cooperative Construction in Extreme North Climates, Leningrad (USSR), May 1977.

Descriptors: *Cold weather construction, *Dams, *Earth dams, *Dam design, Concrete dams, Cold regions, Frozen soils, Permafrost, Freezing, Thawing, Temperature, Structures, Hydraulic structures, Construction, Engineering, Civil engineering, *USSR, *Siberia(USSR).

On the basis of major experimental work and with the use of modern methods of calculating temperature regimes in dams, scientifically justified methods of planning hydrotechnical installations have been worked out for the Far North; basic principles have been established for the design of both earth and concrete dams; and engineering procedures have been introduced that make it possible to work year-round on dam construction. The construction of many dams with various heads has yieldeda great deal of experience and proved the possibility of successfully erecting dams under the most severe conditions in the Far North of the USSR. (Sims-ISWS)
W79-02868

PREDICTING PERFORMANCE OF PIPE CULVERTS BURIED IN SOIL.
Purdue Univ., Lafayette, IN. Engineering Experiment Station.
G. A. Leonards, and M. B. Roy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 638, Price codes: A11 in paper copy, A01 in microfiche. Report No. FHWA-JHRP-76-15, May 1976. 235 p, 46 fig, 7 tab, 95 ref, 5 append. C-36-32F, HPR-1(12) Pt II.

Descriptors: *Culverts, *Pipes, *Structural design, *Underground structures, Analytical techniques, Finite element analysis, Numerical analysis, Computer programs, Loads(Forces), Mathematics, Soils, Soil properties, Anisotropy, Construction materials, Stress analysis, Strain.

An analytical tool based on the finite element method was developed to analyze buried culvert problems in a realistic fashion. Segments of a curved bar with three degrees of freedom (normal, tangential, and rotational) at each end were used to simulate a thin pipe where nodal moments are important. Triangular, isoparametric elements with one curved boundary (to fit the shape of pipe), and three midside nodes were used to represent the soil. A special type of 'interaction' element with zero thickness was used between pipe and soil to simulate interface behavior, including slip and/or the inability to resist tensile stresses. Nonlinear, anisotropic soil properties were accounted for. Actual test data were used as input for soil properties. A computer program was written to include all the aspects mentioned above, and example problems were solved to demonstrate its versatility and to investigate the influence of such factors as non-linear soil properties, relative stiffness of pipe and soil, inclusion of weak materials near the spring line, and construction procedures. The present program is applicable only for analysis of two-dimensional problems transverse to the pipe in which the state of stress either in the soil mass or in the pipe does not approach failure. (Humphreys-ISWS)
W79-02869

RECOMMENDED PRACTICE FOR THE DESIGN AND CONSTRUCTION OF EARTH DAMS FOR INDUSTRIAL AND POTABLE WATER SUPPLY IN THE FAR NORTH AND PERMAFROST AREAS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 748, Price codes: A06 in paper copy, A01 in microfiche. CRREL Draft Translation 647, September 1977. 121 p, 49 fig, 14 tab, 7 append. 113 p. Kuz'mina, L.N. editor.

Descriptors: *Earth dams, *Cold weather construction, *Dams, *Hydraulic structures, Permafrost, Cold regions, Construction, Structures, Soils, Frozen soils, Freezing, Thawing, Temperature, Foundations, Dam foundations, Water resources, Water supply, Engineering, Civil engineering, *USSR.

The problem of erecting permanent earth dams in water-engineering systems built to supply potable and process water were examined. The dams in question were frozen dams, intended for operation with the impervious element and its foundation kept permanently in the frozen state. Specific problems of erecting thawed dams in the Far North also were examined. (Sims-ISWS)
W79-02871

ANALYSIS OF CONSOLIDATION OF EARTH AND ROCKFILL DAMS, VOLUME I, MAIN TEXT AND APPENDICES A AND B,
California Univ., Berkeley, Coll. of Engineering.
C. S. Chang, and J. M. Duncan.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A045 332, Price codes: A07 in paper copy, A01 in microfiche. Contract report S-77-4, Volume I, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, September 1977. 143 p, 52 fig, 3 tab, 71 ref, 2 append. DACW39-74-C-0027.

Descriptors: *Earth dams, *Soils, *Consolidation, *Model studies, Mathematical models, Clays, Saturated soils, Rockfill dams, Instrumentation, Dams, Finite element analysis, Soil water, Soil water movement, Permeability, Compressibility, Stress, Flow, Theoretical analysis, Soil science.

This study was undertaken to develop the theory for analyzing the consolidation of partly saturated clay soils, and subsequently to develop a practical procedure for performing finite analyses of the behavior of dams during construction, during reservoir filling, and during the development of long-term seepage. The theory developed couples the effects of both stress and flow and takes account of the varying permeability and compressibility of the pore fluid and the nonlinear stress-strain behavior of the soil. A number of elastic-plastic, stress-strain relationships were reviewed with respect to their capabilities for modeling the stress-strain behavior

of compacted clays. The results of this study indicated that the behavior of the dam during consolidation is closely related to the stiffness and degree of saturation of the core. The finite element procedure developed is a potentially useful tool. It seems likely that its greatest value in application will be in connection with interpretation of instrumentation studies for zoned earth and rockfill dams. (Sims-ISWS)
W79-02875

8E. Rock Mechanics and Geology

REVIEW AND ANALYSIS OF BLASTING AND VIBRATIONS AT BANKHEAD LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8H.
W79-02701

RESULTS OF IN SITU MODULUS OF DEFORMATION TEST, CANNELTON LOCK AND DAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. L. Stowe.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 827, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper C-71-4, May 1971. 47 p, 32 fig, 2 tab.

Descriptors: *Deformation, *Borehole geophysics, *Rock mechanics, *Rock properties, On-site investigations, Rocks, Shales, Limestones, Strength, Loads(Forces), On-site tests, Foundations, Rock foundations, Locks, Dams, Civil engineering, Geology, *Cannelton Lock and Dam(Ohio River), plate bearing tests.

An NX-size, borehole, plate-bearing device known as a Goodman jack was used to perform 31 load deformation tests in the foundation rock, Pier No. 3, at Cannelton Lock and Dam. The in situ modulus of deformation was calculated using the load deformation data. These data were examined to evaluate the quality of the foundation rock; the foundation rock consists of Menard formation limestone, Waltersburg shale, Vienna limestone, and Tor Springs sandstone. The test results indicated that the top 35 ft of Waltersburg shale near the upstream side of Pier No. 3 is about twice as competent as the shale near the downstream side. The average moduli of deformation are 18,620 and 38,650 psi for the upstream and downstream sides, respectively. Moduli for the limestones and the sandstone are above 100,000 psi. The load deformation curves exhibit accelerated displacement at load levels above 500 psi. This displacement is due to either shear failure of the shale, sliding along pre-existing planes of weakness, or a combination of both. (Sims-ISWS)
W79-02710

THE OXFORD UNIVERSITY WATER CAVITATION TUNNEL. DESCRIPTION AND OPERATING PROCEDURES,
Oxford Univ. (England). Dept. of Engineering Science.
For primary bibliographic entry see Field 8B.
W79-02860

SPRAY GROUTING: SUMMARY OF RESEARCH, DEVELOPMENT, UTILIZATION, AND FUTURE USES,
Minnesota Univ., Minneapolis, Dept. of Civil and Mining Engineering.
For primary bibliographic entry see Field 8F.
W79-02863

8F. Concrete

EFFECT OF SUBZERO TEMPERATURE IN CONCRETE ON THE NATURE OF OPERATIONS OF HIGH CONCRETE DAMS,
V. N. Durcheva.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 016, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 531, July 1976. 8 p, 3 fig. Translated from Gidrotekhinicheskoe Stroitel'stvo, No. 3, p 26-29, March 1973.

Descriptors: *Dams, *Reservoir operations, *Cold regions, Concrete, Concrete structures, Concrete dams, Temperature, Freezing, Cold weather construction, Stress, Construction joints, Expansion joints, Thermal expansion, Loads(Forces), Engineering, Civil Engineering, *USSR.

Comprehensive, large-scale studies of the dams of the Bratsk and Krasnoyarsk hydroelectric stations have provided a wide range of experimental material on the operation of high dams under severe climatic conditions and, in particular, have revealed the role of temperature as the most important factor causing deformation and stress in dams. The calculation of temperature stresses which arise in dams during construction and during operation does not take into consideration the changes in the physical and mechanical properties of frozen concrete. This is hindered by the lack of qualitative relations which define the effect of subzero temperature on the principal characteristics of monolithic hydroengineering concrete. Experimental and full-scale studies of the properties of frozen concrete have made it possible to recommend empirical relationships for determining the linear expansion coefficient as a function of the subzero temperature of concrete and its strength. (Sims-ISWS)
W79-02690

CONCRETE PLACING TECHNIQUES USED DURING THE CONSTRUCTION OF THE KRASNOIARSK HYDROELECTRIC POWER PLANT,
Ye. A. Dolginin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 967, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 534, July 1976. 13 p, 3 fig, 4 tab. Translated from No. 9, p 19-23, September 1972.

Descriptors: *Concrete dams, *Dam construction, *Cold weather construction, Winter, Construction, Dams, Powerplants, Hydroelectric power, Concrete, Concrete structures, Freezing, Stress, Strength, Temperature, Engineering, Civil engineering, *USSR, Construction techniques.

The concrete Krasnoyarsk hydroelectric station dam, 124 m high, is approximately 1,100 m long and is located in a relatively narrow rocky canyon of the Yenesey River. The amount of concrete in the dam and hydroelectric station building is 5.5 million cu m. The concrete operations were accomplished under severe climatic conditions--the frost-free period was 102 days long and temperatures ranged from -54 to 37C. Great requirements were levied on the concrete with regard to strength, imperviousness to water, cavitation resistance, cold resistance, and fracturing resistance. This report discussed the construction problems and considerations. (Sims-ISWS)
W79-02691

COEFFICIENT OF LINEAR EXPANSION OF MASSIVE CONCRETE AT A NEGATIVE TEMPERATURE,
S. Ya. Eydel'man, and V. N. Durcheva.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 067, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 537, July 1976. 19 p, 9 fig, 3 tab, 6 ref. Vol. 84, p 158-170, 1967.

Descriptors: *Concrete, *Thermal expansion, *Concrete dams, *Cold regions, Freezing, Thawing, Dams, Stress, Expansion, Deformation, Construction joints, Expansion joints, Temperature, Cold weather construction, On-site investigations, Laboratory tests, Concrete testing, Engineering, Civil engineering, *USSR.

The article presented the results of full-scale extensometric measurements of free thermal deformations of concrete in 41 sections of the Bratsk hydroelectric station dam at a negative temperature. It was shown that the coefficient of linear expansion of frozen concrete is 1.6 times greater, on the average, than at a positive temperature, and that there is a relationship between these coefficients and the strength of the concrete. Melting of the concrete is accompanied by the appearance of residual deformation of elongation. Tests specially conducted on samples 10 x 10 x 40 cm in size of different composition of the concrete yielded similar results. Data were provided on the effect of a change in the value of the coefficient of linear expansion of the frozen concrete on openings of construction joints and cracks as well as the stress state of the concrete. (Sims-ISWS)
W79-02692

CONSTRUCTING CONCRETE DAMS IN REGIONS WITH SUBZERO AVERAGE YEARLY TEMPERATURE,
K. A. Mal'tsov, Sh. N. Plyam, and L. I. Kudoyarov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 936, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 549, October 1976. 9 p, 5 fig, 10 ref. Translated from Izvestiya Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Gidrotekhiki, Vol. 101, p 133-138, 1973.

Descriptors: *Concrete structures, *Concrete dams, *Cold weather construction, *Cold regions, Dams, Construction, Temperature, Freezing, Permafrost, Thermal expansion, Strength, Mechanical properties, Structures, Hydraulic structures, Concrete, Expansion, Deformationl Engineering, Civil engineering, *USSR.

Building concrete hydraulic engineering structures in regions with severe climatic conditions characterized by a sub-zero average yearly temperature raises a number of problems which do not occur when dams are construted in regions with a moderate or warm climate. These problems arise because of the complete freezing of a considerable amount of the embankment of a concrete dam during the operational period on the one hand, and the change in the thermomechanical properties of the concrete (coefficient of linear expansion, strength, modulus of elasticity, etc.), on the other hand. This report addressed those problems. (Sims-ISWS)
W79-02697

POTENTIAL ALKALI-CARBONATE ROCK REACTIVITY OF SOME OF THE AGGREGATE USED IN FISHTRAP DAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
A. D. Buck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 761, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper C-76-3, June 1976. 24 p, 4 fig, 6 tab, 8 ref.

Descriptors: *Aggregates, *Alkali-aggregate reactions, *Laboratory tests, *Concrete testing, Concrete, Dams, Spillways, Concrete dams, Carbonate rocks, Chemical reactions, Alkalis(Bases), Petrography, Cores, Coarse aggregates, Analytical techniques, Civil engineering, *Fishtrap Dam(Ky).

Two samples of carbonate rock coarse aggregate were obtained from the quarry that furnished some of the coarse aggregate for Fishtrap Dam, located near Pikeville, Kentucky. These materials were subjected to petrographic examination. Small rock cores were prepared from some of these aggregate

particles and were tested for length change in sodium hydroxide solutions. Five concrete mixtures were made in the laboratory using these aggregates; specimens from these mixtures were made in the laboratory using these aggregates; specimens from these mixtures were tested for length change durng moist storage or during storage in laboratory air followed by moist storage; other specimens were tested for compressive strength. Six concrete cores from the spillway portion of Fishtrap Dam were received in the laboratory. They were inspected and photographed. Thin sections were made, and selected specimens were tested for length change during moist storage. It was concluded that an alkali-carbonate rock reaction had occurred at Fishtrap Dam. There was no indication that this was a deleterious reaction. It is likely that the use of low-alkali portland cement and relatively small aggregate size served to keep the reaction at a safe level. It is also possible that natural dilution of the reactive rock by innocuous rock had a moderating effect on the reaction. (Sims-ISWS)
W79-02705

ENGINEERIN CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF EMSWORTH LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
C. E. Pace.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 844, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper C-76-8, August 1976. 153 p, 52 fig, 2 tab, 3 ref, 1 append.

Descriptors: *Locks, *Dams, *Ohio River, *Structural analysis, *Structural stability, Structures, Concrete, Concrete structures, Concrete dams, Concrete testing, Surveys, Stress, Strength, Cracks, Weathering, Evaluation, Engineering, Civil engineering, *Emsworth Locks and Dam(Ohio River).

The Concrete Laboratory at the Army Engineer Waterways Experiment Station was contracted to prepare an engineering condition survey and structural investigation for Locks and Dam 3, Monongahela River, and Emsworth and Montgomery Locks and Dams, Ohio River. This report gave the results of an engineering condition survey and a structural analysis of Emsworth Locks and Dam, Ohio River. In general, the monoliths on the land wall do not meet present day criteria for overturning, sliding, or base pressures. Also, some monoliths in the middle and river walls do not meet present day stability requirements. In fact, the stability analysis of M-22 along with the visual observation of a 1-1/2 inch separation between the ceiling of the emptying culverts and the middle wall indicated that there has been some movement of these middle wall monoliths. The main concern for concrete interity is the cracked, spalled, and deteriorated surface concrete which will allow accelerated deterioration, reducing the effective section of the monoliths and increasing the already excessive tensile stresses. In general, if corrective measures are not taken, this will surely cause maintenance expense and also will reduce the life of the concrete monoliths. The compressive stresses are larger than indicated by the stress analysis and also can cause problems in deteriorated concrete. From the deteriorated condition of the surface of the lock monoliths, it is evident that some action must be initiated. Since corrective action is needed, a feasibility study should be made to determine what action is necessary which will provide the most economical and adequate lock usage over a period of 30 to 50 years. (Sims-ISWS)
W79-02706

CONDITION SURVEY OF LOCK AND DAM 3, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
B. J. Houston
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 817, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper C-74-7, May 1974. 61 p, 28 fig, 3 tab, 6 ref, 5 append.

Descriptors: *Locks, *Dams, *Ohio River, *Structural analysis, Structural stability, Structures, Concrete, Concrete structures, Concrete dams, Concrete testing, Surveys, Borehole cameras, Photography, Stress, Cracks, Weathering, Evaluation, Engineering, Civil engineering, *Lock and Dam 53(Ohio River).

A condition survey of Lock and Dam 53, which is located on the Ohio River between Paducah, Kentucky, and Cairo, Illinois, was authorized and funded by the Army Engineer District, Louisville, in April 1973. Lock and Dam 53 was constructed approximately 45 years ago, and the purpose of this investigation was to determine the general condition of the structure in order that effective plans could be made to accomodate present and future river traffic. The Army Engineer Waterways Experiment Station was requested to conduct a part of the investigation, including a crack survey, borehole camera studies in drilled holes, and sonic studies of the structure. The Ohio River Division Laboratory (ORDL) conducted physical tests and a petrographic examination of drilled concrete cores. Results of ORDL's tests were included in this report. The results of the investigations indicated that the concrete in the underwater sills, the piers, and the fixed weir is dense, homogeneous concrete free from damage from cement-aggregate reaction, from sulfate attack, and from serious frost damage. Cracking of the concrete was extensive, but not excessive, and apparently can be attributed to physical causes such as freeze-thaw cycles of the exposed concrete, normal shrinkage, and minor foundation problems. Excessive cracking was found only in pier 2. The cracking in pier 2, however, is not considered to be structurally damaging. (Sims-ISWS)
W79-02711

NONMETALLIC WATERSTOPS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
G. C. Hoff, and B. J. Houston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 955, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper C-70-22, October 1970. 31 p, 7 fig, 3 tab, 16 ref.

Descriptors: *Concrete structures, *Waterproofing, *Watertight, *Sealants, Laboratory tests, Onsite investigations, Weathering, Tensile strength, Physical propeties, Materials, Materials testing, Construction joints, Expansion joints, Concrete, Civil engineering, *Waterstops, *Nonmetallic waterstops.

Nonmetallic waterstops having suitable properties for use in joints in hydraulic structures of concrete have been made successfully from natural rubber, synthetic rubber, and polyvinyl chloride. To perform satisfactorily, a waterstop must have sufficient strength and extensibility to avoid being ruptured by joint movement, and it must maintain strength and extensibility over the temperature range and in spite of chemical attack from the environment of service. The waterstop also must have suitable dimensions and configuration and be installed so as to avoid waterflow around the embedded ends. Field and laboratory studies led to the conclusion that suitable waterstop materials should have a tensile strength of at least 1,400 psi (plastic), 2,000 psi (rubber), the ability to elongate 280% (plastic) or 360% (rubber), and to have various levels of maintenance of relevant properties after various chemical and thermal exposures. (Sims-ISWS)
W79-02712

LABORATORY TESTS OF CONCRETE AGGREGATE AND RIPRAP FOR NEW LOCK AND DAM NO. 26,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab
W. O. Tynes, and C. R. Hallford.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 838, Price codes: A06 in paper copy, A01 in microfiche. Miscellaneous Paper C-72-4, March 1972. 113 p, 16 fig, 11 tab.

Descriptors: *Aggregates, *Mississippi River, *Riprap, *Rocks, *Concrete, Dams, Locks, Laboratory tests, Testing, Coarse aggregates, Limestones, Carbonate rocks, Construction materials, Strength, Chemical reactions, Structures, Hydraulic structures, Concrete technology, Engineering, Civil engineering, *Lock and Dam No. 26(Mississippi River).

Ledge rock from 3 commercial sources was tested for suitability for use as riprap, and material from 1 of the sources of ledge rock as well as crushed aggregate also were tested for use as concrete coarse aggregate. Drilled 6-inch-diameter cores from 2 commercial sources were tested for suitability for use as riprap and concrete coarse aggregate A coarse sand and a blending sand were tested for use as concrete fine aggregate. Crushed aggregate manufactured from each of the 2 cores and 1 of the ledge rocks was tested in combination with blends of the coarse and fine sand for freezing and thawing of concrete aggregate. Results of the petrographic examination and tests on 5 sources of carbonate rock for riprap were reported. Consideration of the results of the freezing-and-thawing tests conducted according to CRD-C 144 on 3 sources of carbonate rock for use in concrete indicated similarity. However, it appears that the material from 1 company is preferable to the others because it is thicker bedded. Material from a nearby quarry was used previously in the Alton Lock and Dam, and it is known to be a reactive carbonate rock. Reaction rims have been observed in the Alton concrete. Considerations of field behavior of the Alton concrete and laboratory testing for length change of the Alton concrete showed that this is not an expansive reaction and no precautionary measures are required for its use. Evaluation of rock from the Columbia Quarry and the Riverview Quarry for potential reactivity indicated that that Columbia rock was not reactive. However, some of the ledge 3 Riverview rock is potentially reactive. (See also W77-10978) (Sims-ISWS)
W79-02854

SPRAY GROUTING: SUMMARY OF RESEARCH, DEVELOPMENT, UTILIZATION, AND FUTURE USES,
Minnesota Univ., Minneapolis, Dept. of Civil and Mining Engineering.
C. R. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 340, Price codes: A02 in paper copy, A01 in microfiche. Report NSF-RA-T-75-073, December 8, 1975, 5 p. NSF GI-37862X.

Descriptors: *Grouting, *Cement grouting, *Tunneling, *Sandstones, Rocks, Tunnels, Stability, Strength, Tunnel linings, Rock bolts, Tunnel construction, Spraying, Sodium compounds, Civil engineering, *Spray grouting

A spray grouting technique was developed for hardening a 1 to 6 inch surface layer of weak sandstones, such as the St. Peter Sandstone in Minnesota. When used on tunnel walls and roofs, the technique provides temporary excavation support in larger tunnels and a permanent lining in smaller utility tunnels. This eliminates or reduces the need for more costly conventional support The research and deveopment has cost about $100,000 in RANN funds, and $50,000 of industry user funds. The technique is being used now in an 8,000 foot long storm water tunnel and in a 6,500 foot long utility tunnel. The estimated savings from the use of the new method is $1,300,000 on these two projects. Increased use of the method is expected. (Sims-ISWS)
W79-02863

DESIGNING CONCRETE DAMS FOR ESPECIALLY HARSH CLIMATIC CONDITIONS,
All-Union Designing, Surveying and Scientific Research Inst., Hydroproject, Leningrad (USSR)

V. I. Teleshev, and S. A. Frid.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 592, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 657, November 1977. 20 p, 4 fig, 8 ref. Translated from a collection of articles from the Gidroproyekt Institute imeni S. Ya. Zhuk, Leningrad (USSR), p 32-46.

Descriptors: *Dams, *Cold weather construction, *Dam design, *Concrete dams, Cold regions, Powerplants, Design, Planning, Dam construction, Dam foundations, Temperature, Freezing, Concrete, Foreign research, Construction, Structures, Hydraulic structures, Engineering, Civil engineering, *USSR.

During the last 20 years, extensive hydraulic engineering construction projects have advanced far into the depths of regions of the USSR with harsh and very harsh climates. Exploitation of the very rich energy resources of the rivers in the central and eastern parts of Siberia, the coastal regions, and the Far North has posed a number of complex problems which had not been encountered before by designers and builders of hyraulic engineering projects. This report discussed the principal aspects of designing concrete dams on rock foundations in regions with especially harsh climates. (Sims-ISWS)
W79-02864

8G. Materials

EFFECT OF SUBZERO TEMPERATURE IN CONCRETE ON THE NATURE OF OPERATIONS OF HIGH CONCRETE DAMS,
For primary bibliographic entry see Field 8F.
W79-02690

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE,
Matrecon, Inc., Oakland, CA.
H. E. Haxo, Jr., and R. M. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 913, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-255, September 1976. 63 p, 3 fig, 22 tab, 5 ref, 1 append. EPA 68-03-2134.

Descriptors: *Linings, *Materials, *Leachate, *Laboratory tests, Materials testing, Evaluation, Landfills, Membranes, Impervious membranes, Asphalt, Plastics, Polymers, Soil cement, Soil asphalt, Rubber, Water pollution, Water pollution control, Liner materials.

This report presented available information covering the first year's exposure to liner materials to sanitary landfill leachate. Included in the report were descriptions of the monitoring and dissassembly of the generators to recover the liner specimens, the results of the testing of the exposed liners, and a discussion of the results. The year's exposure did not result in losses of impermeability in any of the liners. There were some losses, however, in the compressive strength of the admix liner materials. There were some losses in the physical properties of some of the polymeric membranes and swelling of most of these membranes. The seams of several lost strength, the crystalline types of polyethylene, polypropylene, and polybutylene sustained the least change during the year's exposure. However, these liners, or films, are prone to puncture and tear and are generally difficult to handle in the field. The thermoplastic membranes, chlorinated polyethylene, chlorosulfonated polyethylene (Hypalon), and polyvinyl chloride, tended to swell the most. The vulcanized rubbery liner materials, e.g., butyl and EPDM, changed little during the exposure period but had the lowest initial seem strength. The data presented must be considered as preliminary in an ongoing project; it is premature at this point to make estimates of the service life of the various materials or to make relative comparisons among them for use in a given installation without consideration to costs and to the specifics of the installation. (Sims-ISWS)
W79-02704

POTENTIAL ALKALI-CARBONATE ROCK REACTIVITY OF SOME OF THE AGGREGATE USED IN FISHTRAP DAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8F.
W79-02705

ENGINEERIN CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF EMSWORTH LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8F.
W79-02706

DEVELOPMENT OF A HIGH PRECISION CAPABILITY FOR MONITORING STRUCTURAL MOVEMENTS OF LOCKS AND DAMS,
Army Engineer Topographic Lab., Fort Belvoir, VA. Research Inst.
For primary bibliographic entry see Field 8A.
W79-02708

RESULTS OF IN SITU MODULUS OF DEFORMATION TEST, CANNELTON LOCK AND DAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8E.
W79-02710

CONDITION SURVEY OF LOCK AND DAM 3, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8F.
W79-02711

NONMETALLIC WATERSTOPS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8F.
W79-02712

AN INVESTIGATION OF ICE FORCES ON VERTICAL STRUCTURES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2C.
W79-02865

CONDITION SURVEY-ASBESTOS-BONDED STEEL CULVERTS IN WESTERN OREGON,
Federal Highway Administration, Portland, OR. Region 10.
S. Deocampo, T. Gruber, and B. Wasill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 377, Price codes: A06 in paper copy, A01 in microfiche. Report No. FHWA-OR-76-1, 1976. 109 p, 1 fig, 1 tab, 9 ref. 10-2.

Descriptors: *On-site investigations, *Culverts, *Linings, *Corrosion, *Oregon, Surveys, Roads, Highways, Pipes, Construction materials, Corrosion control, Abrasion, Coasts, Brackish water, Metal pipes, Hydraulic structures, Deterioration, Steel, Aluminum, Coatings, Bituminous material, Asbestos-bonded coating, Corrugated metal.

A field investigation of 33 highway culvert installations was made in December 1975 and January 1976 to evaluate the service life of corrugated metal culverts on coastal highways, with emphasis on the durability of the asbestos-bonded protective treatment in marine and brackish water. Metal culverts also were studied. The survey was limited to visual examination and qualitative appraisal of the conditions noted, primarily to document performance to date and to collect data for future study and monitoring. No attempt was made to quantify metal loss. The report included the individual inspection records and some photos. (Humphreys-ISWS)
W79-02870

EVALUATION OF THE CORROSION RESISTANCE OF ALTERNATE REVETMENT WIRE FABRIC MATERIALS IN THE LOWER MISSISSIPPI RIVER,
Construction Engineering Research Lab., Champaign, IL.
E. P. Cox, and C. G. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 558, Price codes: A04 in paper copy, A01 in microfiche. Report CERL-TR-M-221, July 1977. 62 p, 30 fig, 23 tab, 10 ref, 1 append.

Descriptors: *Retaining walls, *Steel, *Corrosion, *Corrosion control, Evaluation, On-site investigations, Laboratory tests, Stainless steel, Reinforcing steel, Concrete, Reinforced concrete, Coatings, protective coatings, Materials, Materials testing, Civil engineering, Revetment mattresses, Wire fabric materials, Corrosion resistance, Bimetallics, Organically coated steels.

This report presented the results of a study of the corrosion resistance and strength of alternate fabric materials for use in articulated concrete revetment mattresses to be placed on the lower banks of the Mississippi River. Three groups of materials--stainless steels, bimetallics, and organically coated low-carbon steels--were evaluated based on short-term electrochemical laboratory tests, laboratory sensitization evaluations, and exposures of up to approximately 4 years in freshwater and 15 months in brackish water. (Sims-ISWS)
W79-02872

8H. Rapid Excavation

REVIEW AND ANALYSIS OF BLASTING AND VIBRATIONS AT BANKHEAD LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
R. J. Lutton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 735, Price codes: A05 in paper copy, A01 in microfiche. Technical Report S-76-6, June 1976. 81 p, 30 fig, 11 tab, 8 ref.

Descriptors: *Excavation, *Alabama, *Rock excavation, *Vibrations, Canal construction, Locks, Channels, Explosives, Rocks, Geology, Hazards, Data processing, Engineering, Civil engineering, *Bankhead Lock(AL).

The Army Corps of Engineers recently replaced the old Bankhead Lock on the Black Warrior River, Alabama, with a larger lock. The new lock required an approach canal excavated by the removal of more than 5 million cu yd of rock. Preliminary test shots and an exploratory excavation contract of 0.35 million cu yd established blasting and monitoring techniques that assured that vibration and settlement of the old lock would not be excessive. Shots were monitored with particle velocity pickups on and adjacent to the lock. A relationship between peak particle velocity and scaled distance was checked on the basis of these data after normalization for structure behavior, coupling, and transmissivity. Recommendations from the test shot program were used in specifications for the exploratory excavation contract. The exploratory excavation, with about 50 presplit and production shots, served as a second testing program for refining the previous observations and conclusions, according to various blasthole arrays and time delays. A principal product of this work was a refined criterion for no-damage to be used in the main excavation contract. The experience gained in preliminary work allowed for more realistic and lower unit-price bids on the main contract. During the main contract, involving the excavation of 5 million cu yd of rock, about 1,000 shots were fired on 9 working levels. Analyses of data generated on this project revealed the effects of 3 factors: delay, confinement, and, to a lesser degree, explosive type. A log normal distribution of peak particle velocities was indicated by analy-

ses of data from large groups of presplit and production shots. The distribution model is proposed for use in predicting ground vibrations at specific scaled distances. (Sims-ISWS)
W79-02701

8I. Fisheries Engineering

EFFECTS OF REDUCED NIGHTTIME FLOW ON UPSTREAM MIGRATION OF ADULT CHINOOK SALMON AND STEELHEAD TROUT IN THE LOWER SNAKE RIVER,
Idaho Univ., Moscow. Water Resources Research Inst.
K. M. McMaster, R. G. White, R. R. Ringe, and T. C. Bjornn.
Completion Report, Contribution No. 93, Idaho Forest, Wildlife and Range Experiment Station, July 1977. 64 p, 19 fig, 10 tab, ref, 3 append. Army, Corps of Engineers, DACW8-76-C-0016.

Descriptors: *Instream flow, *Fish migration, *Chinook salmon, *Steelhead trout, Powerplants, *Idaho, *Fish passages, Lower Snake River(Ida), Lower Monumental Dam(Ida), Little Goose Dam(Ida).

During 1975 and 1976, an assessment was made of the effects of reduced nighttime flows on the upstream migration of adult chinook salmon and steelhead trout. During the summer and fall, reducing discharge from the dams to zero at night (2300-0700 hours) had no observable effect on migration of adult fish. During the first phase of the study (July-October 1975), radio telemetry was used and mark-recapture techniques to evaluate chinook and steelhead movement patterns and travel rates during the periods of uncontrolled and reduced nighttime flows. Nighttime flows were provided for 8 hours each night on a 7-day rotating schedule of 0 and 10,000 cfs. No differences were observed in behavior or rates of travel of radio- or magnetic-tagged chinook or steelhead which could be attributed to nighttime flow regimes tested. Seventy-five percent of all steelhead tagged passed through the study area during flow tests. The second phase of the study was an evaluation of 1976 chinook and steelhead passage over lower Snake River dams (using fish counts). This passage was associated with nighttime flows of 0 and 20,000 cfs. on a 2-day alternating schedule. Using analysis of variance and Wilcoxon's signed-ranks test, no significant differences (.05 level) in counts of chinook or steelhead between the two nighttime test flow conditions were found, thus substantiating the 1975 findings.
W79-02919

PHYSIOLOGICAL EFFECTS OF ELECTROFISHING ON LARGEMOUTH BASS,
Northwestern State Univ. of Louisiana, Natchitoches. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-02968

LETHALITY OF ELECTROSHOCK TO TWO FRESHWATER FISHES,
Wyoming Game and Fish Dept., Casper.
For primary bibliographic entry see Field 5C.
W79-02969

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH SUPPORT PROGRAM 1978-1979,
Department of Fisheries and Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 6E.
W79-02928

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1976, SIXTH ANNUAL ISSUE,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering
G. V. Skogerboe, S. W. Smith, and W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 925, Price codes: A14 in paper copy, A01 in microfiche Publication No EPA-600/2-78-042, March, 1978. 311 p.

Descriptors: Fertilizers, Irrigated land, *Salinity, *Return flow, *Bibliographies, Abstracts.

Research related to the quality of irrigation return flow is being conducted at numerous institutions throughout the western United States. Related work is also underway at other institutions in the United States, as well as other portions of the world. Approximately 100 sources of material have been searched for articles pertinent to the National Irrigation Return Flow Research and Development Program. These articles describe water quality problems resulting from irrigated agriculture, potential technological solutions for controlling return flows, recent research pertinent to return flow investigations, and literature associated with institutional constraints in irrigation return flow quality control. The first annual issue of Selected Irrigation Return Flow Quality Abstracts covered publications printed in 1968 and 1969, while the second annual issue lists publications printed in 1970 and 1971, the third annual issue covers calendar years 1972 and 1973, and the fourth and fifth annual issues cover literature published in 1974 and 1975. This annual issue lists publications printed in 1976. This report was submitted in fulfillment of Grant Number R-800426 under the sponsorship of the Office of Research and Development, Environmental Protection Agency. (Skogerboe-Colorado State)
W79-02580

THE USE OF POTASSIUM PERMANGANATE ($KMnO_4$) IN FISHERIES; A LITERATURE REVIEW,
Fish and Wildlife Service, Fayetteville, AR. South Central Reservoir Investigations.
For primary bibliographic entry see Field 5G.
W79-02585

WATER CONSERVATION INFORMATION DISSEMINATION DURING THE 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W79-02904

10D. Specialized Information Center Services

DESALINATION TECHNOLOGY TRANSFER CENTER,
Fairleigh Dickinson Univ., Teaneck, NJ. Coll. of Science and Engineering.
For primary bibliographic entry see Field 3A.
W79-02840

WATER CONSERVATION INFORMATION DISSEMINATION DURING THE 1977 DROUGHT EMERGENCY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 3B.
W79-02904

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- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SUBJECT FIELDS AND GROUPS

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01 NATURE OF WATER
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02 WATER CYCLE
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A PARAMETRIC MODEL CALIBRATED WITH A PHYSICALLY BASED MODEL FOR RUNOFF PREDICTION FROM UNGAGED STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
F. W. Bond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 690, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, 1977. 94 p, 30 fig, 3 tab, 17 ref, 2 append. OWRT A-077-ARIZ(1). 14-34-0001-7006.

Descriptors: *Model studies, Forecasting, *Runoff forecasting, Streamflow, *Parametric models, Simulation analysis, Rainfall-runoff relationships, Rainfall intensity, *Watershed modeling.

Recent developments in the numerical solution of the governing partial differential equations for overland and channel flow (represented by sets of intersecting planes) should make possible models which predict runoff from ungaged streams. However, these models (physically based models) are complex and require much computer time. Parametric models exist which have the advantage of being relatively simple, and once calibrated may be used efficiently and inexpensively. This study developed a procedure for calibrating a parametric model against a physically based model utilizing base areas of one acre and one square mile, with the expectation that base areas can be combined to model real watersheds. Simulation experiments with the physically based model showed that, for the one-acre base area, the dominant parameters relate to the slope and friction of the planes, whereas for the square-mile area, the dominant parameters relate to the channel properties. The simple model-fitting parameters were the cell storage ratio, K, for the one-acre area, and K plus a lag factor, L, for the square-mile area. These parameters decreased more or less exponentially with increasing rainfall intensity and with changes in the physical parameters that produced high peaks and fast runoff.
W79-03003

ASPECTS OF PRESENT HYDROLOGICAL AND WATER QUALITY MODELLING,
Karlsruhe Univ. (Germany, F.R.). Inst. fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 6A.
W79-03082

A NEW APPROACH TO URBAN WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.
For primary bibliographic entry see Field 6A.
W79-03124

URBAN RUNOFF CONTROL PLANNING,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
For primary bibliographic entry see Field 6B.
W79-03273

THE GENERAL LINEAR MODEL WITH PRIOR INFORMATION,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 2E.
W79-03280

EFFECTS OF SIZE AND SHAPE OF A REGION ON DROUGHT COVERAGE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Colorado State Univ., Fort Collins. Hydrology and Water Resources Program.
For primary bibliographic entry see Field 2B.
W79-03296

A PRECARIOUS BALANCE UPSET,
V. A. Kovda.
UNESCO Courier, July 1977, p 10-14. 3 fig.

Descriptors: *Desertification, *Comprehensive planning, *Water balance, *Forecasting, Fallowing, Surface runoff, Erosion, Water management(Applied), Water levels, Climatology, Cycles.

In this review of desertification (which this author refers to as aridification), we are shown how the phenomenon traditionally begins as a result of deforestation, increasing surface runoff, a lowering of groundwater tables, and deterioration of grasslands while temperatures and rainfall remain normal. Arid lands can be used productively with cautious and sensible irrigation and grazing management, although today, as in the past, the natural tendency toward desertification and cyclical climatic changes has been greatly aggravated by human error. Characterized by a lack of water, all the arid, semiarid, and dry steppelands of the world are fragile and unstable. Despite the need to maintain an ecological balance in these areas, primitive methods of farming based upon one-crop systems, excessive grazing, and nomadic livestock production beyond the carrying capacity of pastures have been the rule rather than the exception. Unfavorable climatic fluctuations, coupled with the slow pace at which modern knowledge and improved management techniques are disseminated and accepted, have caused specialists to forecast that the trend toward desertification may be expected to continue. (Tickes-Arizona)
W79-03432

2B. Precipitation

DIURNAL VARIATION IN RAINFALL AND CLOUDINESS,
Hawaii Univ., Honolulu. Water Resources Research Center.
T. A. Schroeder, B. J. Kilonsky, and B. N. Meisner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 704, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No 112, July 1977. 67 p, 56 fig, 8 tab, 43 ref. OWRT A-072-HI(1). 14-34-0001-7026.

Descriptors: *Meteorological satellites, *Orographic precipitation, *Rainfall, *Hawaii, Precipitation, Sea breezes, Climatology, Meteorology, *Clouds, Maps, *Rainfall-temporal distribution, *Trade winds.

Maps of diurnal rainfall patterns based on hourly rainfall records are presented for the six major Hawaiian islands. The resulting rainfall distributions demonstrate the complexity of the interaction between trade winds and large islands. Distributions for windward stations on the low islands have early morning maxima common to the tradewind rainfall over open oceans. Mesoscale circulations and moisture extraction by windward mountain barriers modify the oceanic pattern, particularly on the high islands. Patterns on Hawai'i shift from nocturnal maxima on windward coasts to pronounced day time maxima on the leeward coasts. At higher windward elevations on Mauna Loa and Mauna Ke'a, the pattern shows afternoon peaks as contrasted to nocturnal maxima at windward coasts, such as at Hilo. First harmonic R2 approached .90 at windward stations on small islands and in regions of strong mesoscale circulations. For the largest island, Hawai'i, R2 exceeded .60 for all stations examined. Hourly mean cloudiness maps for a two-week period in July 1976 are presented for Hawai'i Island based on SMS-2 geostationary satellite images. Tests verify the subjective analysis procedure, particularly when applied to the visible images. Although rainfall over most of the island was below normal, rainfall frequencies were not, indicating that observed cloudiness was typical of summer conditions. Stations were geographically grouped. Windward coastal stations have small diurnal cloudiness variations but pronounced nocturnal rainfall maxima. Higher elevation windward stations have larger cloudiness variation but smaller rainfall variation, while leeward stations have large and pronounced variations in both rainfall frequency and cloudiness, with maxima occurring in the late afternoon.
W79-03033

CHEMICAL COMPOSITION OF ACID PRECIPITATION IN PASADENA, CALIF.,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering Science.
For primary bibliographic entry see Field 5A.
W79-03054

HYDROLOGY OF SMALL OCEANIC ISLANDS - INFLUENCE OF ATMOSPHERIC PRESSURE ON THE WATER TABLE,
Washington State Univ., Pullman. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W79-03056

HISTORICAL CLIMATOLOGY,
University of East Anglia, Norwich (England). Climatic Research Unit.
M. J. Ingram, D. J. Underhill, and T. M. L. Wigley.
Nature, Vol 276, No 5686, (Climatology Supplement), p 329-334, November 23, 1978. 8 fig, 2 tab, 35 ref.

Descriptors: *Climatology, *History, *Analytical techniques, Data processing, Methdology, Weather data, Climates, Climatic data, Temperature, Precipitation(Atmospheric), Documentation, Information retrieval, Meteorology, Weather, *Historical climatology.

Descriptive documentary evidence is an important source of detailed information on past climates, particularly for the period between the 11th century and the beginning of the era of instrumental meteorology. Historical climatology is concerned with the study and climatic interpretation of this evidence. However, there are many pitfalls in using historical records, associated with the fact that such records were rarely written primarily as descriptions of climate and with the fact that many readily accessible records are of doubtful reliability. A critical look at existing work in the field was taken, with the aim of isolating many problems which need to be recognized and overcome before historical climatology can be considered to rest on a secure methodological and factual footing. (Sims-ISWS)
W79-03068

TREE-RING EVIDENCE OF PAST CLIMATIC VARIABILITY,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
V. C. LaMarche, Jr.
Nature, Vol 276, No 5686, (Climatology Supplement), p 334-338, November 23, 1978. 6 fig, 40 ref.

Descriptors: *Dendrochronology, *Paleoclimatology, *Climatology, Precipitation(Atmospheric), Rainfall, Temperature, Weather, Trees, Data collections, Data processing, Analytical techniques, Fluctuations, Variability, Climates, Meteorology, Dendroclimatology.

The increasingly visible impact of climatic variability on human affairs lends a sense of urgency to the task of better understanding the workings of the Earth's climatic system. Actual instrumental observations of climate are relatively short, and therefore, it is necessary to turn to other sources for information about past climates to help develop and test the models that may allow the prediction of climatic anomalies such as prolonged droughts or a series of severe winters. Tree-rings are one of the best sources of climatic proxy information. Tree-rings can provide long, accuractely dated, year-by-year records at many points around the globe, and they can bridge the gap between recent instrumental or historical data and the longer but more generalised geological records. Variations in the width of annual rings reflect the influence of

climatic factors that limit the biological processes governing ring formation within a tree. Study of reconstructions of long records of a variety of climatic and related variables, such as temperature, precipitation, stream runoff, and barometric pressure over periods of several hundred to several thousand years strongly suggests that the climate of the past century or so is not representative of the conditions that frequently have prevailed over long periods. Proxy records are a great help in efforts to anticipate or predict future climate, which may be significantly different from the recent climatic past. (Sims-ISWS)
W79-03069

MECHANISMS AND MODELS OF CLIMATIC CHANGE,
Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
G. J. Shutts, and J. S. A. Green.
Nature, Vol 276, No 5686, (Climatology Supplement), p 339-342, November 23, 1978. 4 fig, 15 ref.

Descriptors: *Climatology, *Model studies, *Mathematical models, Methodology, Analytical techniques, Climates, Variability, Solar radiation, Temperature, Dusts, Carbon dioxide, Heat transfer, Oceans, Albedo, Meteorology, *Climatic change.

Many theories about climate change are essentially untestable, but it is still possible to develop a consistent model based on understandable physics--in fact the data cannot be interpreted without one. It is believed that there is some fundamental defect in all present models: it could be something physically improbable, like an unreasonable effect of tiny solar variationes. More likely there is a fundamental lack in an appreciation of how very interactive systems behave. (Sims-ISWS)
W79-03070

NUMERICAL SIMULATION OF CLIMATE AND CLIMATIC CHANGE,
British Meteorological Office, Bracknell (England).
A. Gilchrist.
Nature, Vol 276, No 5686, (Climatology Supplement), p 342-345, November 23, 1978. 20 ref.

Descriptors: *Climatology, *Model studies, *Mathematical models, Equations, Circulation, Air circulation, Albedo, Carbon dioxide, Air pollution effects, Forecasting, Climates, Weather, Temperature, Air temperature, Meteorology, *Climatic change.

Detailed three-dimensional numerical models of the atmosphere, coupled as necessary to models of other parts of the climatic system, provide the most promising approach to understanding the physical basis of climate. Models of this kind can be used to investigate the impact of anthropogenic pollution on climate. At the present time, the main concern is with increasing concentrations of CO2 which might lead to overall warming of the troposphere, but chemical and thermal pollution also may pose a threat. The possible climatic changes would take place slowly and would involve the response of the slowly reacting parts of the climatic system, particularly the oceans. The problem of how to simulate such changes of climate presents many difficulties which are being studied. (Sims-ISWS)
W79-03071

RECENT DEVELOPMENTS IN ATMOSPHERIC CHEMISTRY,
Cambridge Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 2K.
W79-03072

SOLAR-TERRESTRIAL INFLUENCES ON WEATHER AND CLIMATE,
California Univ., Los Angeles. Dept. of Atmospheric Sciences.
G. L. Siscoe.
Nature, Vol 276, No 5686, p 348-352, November 23, 1978. 2 fig, 59 ref.

Descriptors: *Solar radiation, *Weather, *Climatology, Variability, Temperature, Precipitation(Atmospheric), Ozone, Ultraviolet radiation, Correlation analysis, Regression analysis, Cycles, Droughts, Meteorology, Solar variability, Sun-weather relationships, Climatic change, Sunspots, Magnetic effects.

During the past century over 1,000 articles have been published claiming or refuting a correlation between some aspect of solar activity and some feature of terrestrial weather or climate. Nevertheless, the sense of progress that should attend such an outpouring of 'results' has been absent for most of this period. The problem all along has been to separate a suspected sun-weather signal from the characteristically noisy background of both systems. The present decade may be witnessing the first evidence of progress in this field. Three independent investigations have revealed what seem to be well resolved sun-weather signals, although it is still too early to have unreserved confidence in all cases. The three correlations are between terrestrial climate and Maunder Minimum-type solar activity variations, a regional drought cycle and the 22-yr solar magnetic cycle, and winter hemisphere atmospheric circulation and passages by the Earth of solar sector boundaries in the solar wind. The apparent emergence of clear sun-weather signals stimulated numerous searches for underlying physical causal links. (Sims-ISWS)
W79-03073

PREDICTABILITY OF CLIMATE,
National Center for Atmospheric Research, Boulder, CO.
C. E. Leith.
Nature, Vol 276, No 5686, (Climatology Supplement), p 352-355, November 23, 1978. 2 fig, 10 ref.

Descriptors: *Climatology, *Mathematical models, *Numerical analysis, Forecasting, Weather, Climates, Statistics, Statistical method, Statistical models, Fluctuations, Data processing.

A mathematical framework was presented for the study of the predictability of small changes in the climatic system. From a statistical definition of climate in terms of ensemble averages, a limit to predictability was found which arises from random weather fluctuations. This limit typically referred to as climate noise, is often able to obscure a possible climate signal produced by external forcing. A separation of timescales of climatic response also was presented as a convenient means to distinguish between the fast internal (for example, the atmosphere) and the slow external (for example, the oceans) systems. In this way, it is possible to estimate the climate signal in the internal system that arises from small changes in the slow external system. Finally, a theoretical approach was presented for the inclusion of possible feedback effects in the estimation of a climate signal. Such feedback effects could result from the external climatic system being influenced by a change in the mean properties of the fast internal climatic system. (Sims-ISWS)
W79-03074

PREDICTING TEMPERATURE TREND IN THE NORTHERN HEMISPHERE TO THE YEAR 2000,
British Meteorological Office, Bracknell (England).
M. K. Miles.
Nature, Vol 276, No 5686, (Climatology Supplement), p 356-359, November 23, 1978. 4 fig, 10 ref.

Descriptors: *Climatology, *Temperature, *Air pollution, *Solar radiation, Carbon dioxide, Variability, Fluctuations, Air temperature, Weather, Cycles, Forecasting.

The cooling of the Northern Hemisphere since 1940 has been interpreted variously as the overture to the next Ice Age, the effect of industrial pollution in the atmosphere, or of a decline in the solar output. Are we in a position to judge among these various interpretations and to make a prediction for the next few decades. The link with the next Ice Age may be dismissed as a confusion of timescales; the explanation in terms of atmospheric pollution merits careful examination but seems unlikely to be adequate on its own. Natural fluctuations also must be considered. (Sims-ISWS)
W79-03075

DERIVATION OF EQUATIONS FOR VARIABLE RAINFALL INFILTRATION,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2G.
W79-03095

STOCHASTIC MODELS FOR MONTHLY RAINFALL FORECASTING AND SYNTHETIC GENERATION,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
J. W. Delleur, and L. M. Kavvas.
Journal of Applied Meterology. Vol 17, No. 10 October 1978. p. 1528-1536, 3 fig, 4 tab, 9 ref.
OWRT B-036-IND(18).

Descriptors: *Stochastic processes, *Rainfall, *Forecasting, Time series analysis, Precipitation(Atmospheric), Synthetic hydrology, Monthly, *Model studies, Indiana, Illinois, Kentucky, *Rainfall forecasting, *Ohio River Basin.

The Integrated Autoregressive Moving Average (ARIMA) model was applied to the average monthly rainfall time series over 15 basins located in Indiana, Illinois and Kentucky, with areas varying between 240 and 4000 mi approximately. The record length varied from 492 to 6184 months. The first-order, mixed, autoregressive, moving average model emerged as the most suitable one for forecasting and generation of cyclicly standardized monthly rainfall square roots series. The model passed the goodness-of-fit test in all cases studied. The seasonally differenced, multiplicative model applied to monthly rainfall square roots also passed the goodness-of-fit test in all cases. This model has the advantage of requiring fewer parameters than the prrevious one. However, the use of the differenced models is limited to forecasting of monthly rainfall series and cannot be used for the generation of synthetic rainfall time series, as it does not preserve the monthly standard deviations. Seasonal differencing is effective in removing the periodicities but distorts the spectral structure of the original rainfall series, whereas cyclic standardization only introduces a negligible distrotion in the random component while effectively removing the circularly stationary part.
W79-03112

A METEOROLOGICAL APPROACH TO THE IDENTIFICATION OF DROUGHT SENSITIVE PERIODS IN FIELD CROPS,
Orange Free State Univ., Bloemfontein (South Africa).
L. P. de Bruyn, and J. M. de Jager.
Agricultural Meteorology, Vol. 19, No. 1, January 1978, p. 35-40. 3 fig, 8 ref.

Descriptors: *Crop response, *Drought resistence, *Micrometeorology, Planting management, *Moisture stress, Water utilization, *South Africa, Drought tolerance, Soil moisture, Statistical models, Analytical techniques.

A procedure for the determination of drought sensitive periods in field crops is illustrated. Drought sensitivity is derived by means of a statistical model from the correlation of the number of stress days occurring during short periods with growth and yield. Thirty-three different sets of water supply conditions were obtained for the analysis by following different cultivation practices over ten summer seasons. A local long seasoned (145 days) dryland maize was used as the test crop in this attempt to show how a mathematical model using rainfall and evaporation data can be used to assess the degree of sensitivity of yield to drought occur-

ring in short-term periods during the growing season. Customarily drought stress investigations have concentrated on plant and/or soil moisture data. For the present study, however, sensitivity is derived by the magnitude of significant correlation between stress days and growth and yield. Results indicate that number of stress days is a reliable and accurate indication of drought sensitivity. (Tickes-Arizona)
W79-03130

ANTHROPOGENIC IMPACT ON THE ALBEDO OF THE EARTH,
Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.
J. Otterman.
Climatic Change, Vol. 1, No. 2, p 137-155, 1977. 3 tab, 5 fig, 51 ref.

Descriptors: *Albedo, *Solar radiation, *Grazing, *Remote sensing, *Monitoring, Soil surfaces, Vegetation effects, Irrigation effects, Atmospheric physics.

Activity by man and animal is analyzed here as it affects the surface albedo of the earth. Defined as 'the effective reflectivity integrated over the hemisphere of all possible reflection directions and over all the wavelengths of the solar irradiaton,' surface albedo is variable over different types of terrain. The climatic significance of this study lies in the fact that the albedo of the earth-atmosphere system determines directly how much of the solar irradiation is reflected into space and how much is absorbed by our climatic system. Albedo measurements are complex and can be made either in the laboratory or from the ground, aircraft, or satellite. The anthropogenic impact of overgrazing on change is emphasized here. The unexpected finding from Landsat imagery over Israel is that overgrazing in arid and semiarid regions has a shapr impact of increasing the albedo, where moisture-limited vegetation covers only a fraction of the terrain even when not hindered by man or animal. Additonally, the albedo of clear water bodies is quite low, thus creation of artificial water bodies can result in a sharp decrease of the albedo. Irrigation also results in a very pronounced lowering of the albedo of the soil. Examples from Lake Nasser, the Persian Gulf area, and the Negev-Sinai areas illustrate these observations. But the impact of anthropogenic activities, with the emphasis on overgrazing, prompts this author to recommend continued monitoring, particularly on a seasonal basis in cultivated areas, to determine the effect of albedo on desertification. (Tickes-Arizona)
W79-03134

INTERACTION BETWEEN THE WEST ARABIAN SEA AND THE INDIAN MONSOON,
Institute of Tropical Meteorology, Poona (India).
K. Raghavan, P. V. Puranik, V. R. Mujumdar, P. M. M. Ismail, and D. K. Paul.
Monthly Weather Review, Vol. 106, No. 5, p. 719-724, May 1978. 14 fig, 1 tab, 4 ref.

Descriptors: *Monsoons, *Water temperature, *Sea water, *India, Air circulation, Winds, Vapor pressure, Atmospheric pressure, Meteorology, Snyoptic analysis.

It has been speculated that cold sea surface temperature over the West Arabian Sea leads to a drastic reduction of monsoon rainfall over India and the adjoining region because the cold sea decreases the evaporation rate and increases the surface pressure leading to a reduction in the cross-equatorial flow and moisture flux downstream. The purpose of the present analysis was to test this hypothesis through a short observational study based on the best set of records available for the region. In mid-July 1964, during the International Indian Ocean Expedition, there was a drastic reduction of rainfall in the central parts of India. Surface pressure and temperature, as well as cross-equatorial flow and rainfall were measured in the area. The temperature of the West Arabian Sea was measured and found to be cold over a larger area compared to a wet spell in the same month. Until a high pressure belt approached from India during the drought, there was no organized high pressure zone in the sea as would be expected as a result of the low temperature there. The strengthening and weakening of the Indian monsoon was found, however, to be associated with pressure changes on a synoptic scale, and these pressure changes over India appear to have a controlling influence on the strength of the cross equatorial flow in the West Arabian Sea. (Tickes-Arizona)
W79-03135

A REANALYSIS OF THE SKAGIT CLOUD SEEDING PROJECT,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W79-03275

EFFECTS OF SIZE AND SHAPE OF A REGION ON DROUGHT COVERAGE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Colorado State Univ., Fort Collins. Hydrology and Water Resources Program.
N. Tase, and V. Yevjevich.
Hydrlogical Sciences Bulletin, Vol. 23, No. 2, p 203-212, June 1978. 6 fig, 1 tab, 6 ref. NSF ENG 74-17396.

Descriptors: *Droughts, *Regional analysis, *United States, *Great Plains, Size, Shape, Stochastic processes, Gages, Time, Precipitation(Atmospheric), Gaging, Probability, *Drought coverage, *Drought probabilities, Monthly precipitation series, Time-area models, Historical droughts, Grid points.

The stochastic components of monthly precipitation series at gaging stations over the Great Plains of the United States were used to derive time-area models from which new series were generated at a square grid of points. They served as th information for the analysis of area drought coverage by considering the effects of size and shape of a region. Drought probabilities over a region were more affected by size of the region than by its shape, with the shape affecting drought probabilities in the case of small regions. Droughts were studied best by investigating simultaneously their severity (individual time-unit water shortage), total water deficit over time or area, or both time duration and areal coverage. (Roberts-ISWS)
W79-03296

RAINFALL DISTRIBUTION OVER INDIAN SUB-DIVISIONS DURING THE WETTEST AND THE DRIEST MONSOONS OF THE PERIOD 1901-1960,
Institute of Tropical Meteorology, Poona (India).
O. N. Dhar, A. K. Kulkarni, and G. C. Ghose.
Hydrological Sciences Bulletin, Vol. 23, No. 2, p 213-221, June 1978. 3 fig, 5 tab, 3 ref.

Descriptors: *Monsoons, *Rainfall, *Distribution patterns, *Excessive precipitation, *Droughts, Precipitation(Atmospheric), Variability, Seasonal, Precipitation intensity, Spatial distribution, Data processing, Climatology, *India.

An attempt was made to study the rainfall for the subdivisions of India for the wettest and the driest monsoons (i.e., June-September) during the period 1901-1960. All the rainfall stations in each subdivision were taken into consideration to work out the average rainfall of each subdivision for individual months, seasons, and years. The subdivisions of the country that existed on 1 January 1971 were considered. This study showed that during the 60-year period, 1917 was the wettest year and 1918 the driest year. The rainfall distribution in the monsoon periods (i.e., June to September) of the wettest and driest years, 1917 and 1918, respectively, was studied. Possible meteorological causes for the exceptional rainfall in 1917 and the drought in 1918 also were mentioned briefly. (Sims-ISWS)
W79-03297

ARE DESERTS MAN-MADE,
Cairo Univ., Giza (Egypt).
M. El-Kassas.
UNESCO Courier, July 1977, p 4-6. 2 fig.

Descriptors: *Deserts, *Desertification, *Fluctuations, *Rainfall, *Cycles, Arid lands, Erosion, Equilibrium, Land use, Carrying capacity, Seasonal, Variability, Economic aspects, Political aspects.

This author characterizes the world's deserts, which cover approximately one-third of the Earth's land surface, into runoff deserts, rainfall deserts, and rainless deserts. Such categorizaton, he admits, is arbitrary, but certainly rainfall, or the lack of it, is one of the crucial climatic elements shared by all arid and semiarid regions. Principle considerations are the seasonal, variable, short-term, deficiency characteristics of rainfall, all of which play a role in the phenomenon of desertification, defined for the purpose of this analysis as retrogressive ecological changes in vegetation, soil, and water regimes that reduce productivity, lower carrying capacity, or make the land more vulnerable to erosion. Organisms, man, plant, animal, are all in a precarious and dynamic equilibrium in these arid areas with scarce natural resources. Failure to keep within the bounds of this equilibrium can create irreversible desertification. Traditionally, land usage in these regions has followed a cyclic pattern, including shifting cultivation followed by colonization and orchard periods, with the end result always being deterioration of the land. An analysis of these cyclic patterns supports this author's conclusion that desertification is but the end result of ecological, economic, and political pressures. (Tickes-Arizona)
W79-03436

2C. Snow, Ice, and Frost

WASTEWATER TREATMENT IN COLD CLIMATES,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5D.
W79-03020

SEDIMENTOLOGY OF MEDIAL MORAINES ON BERENDON GLACIER, BRITISH COLUMBIA, CANADA: IMPLICATIONS FOR DEBRIS TRANSPORT IN A GLACIERIZED BASIN,
University of East Anglia, Norwich (England). School of Environmental Sciences.
N. Eyles, and R. J. Rogerson.
Geological Society of America Bulletin, Vol 89, No 11, p 1688-1693, November 1978. 9 fig, 48 ref.

Descriptors: *Glaciers, *Canada, *Sediments, *Glacial sediments, On-site investigations, Laboratory tests, Glacial drift, Particle size, Rocks, Bedrock, Glaciology, Sedimentology, *Berendon Glacier(Canada).

The character of sediments from medial moraines on Berendon Glacier, British Columbia, reflects periglacial processes rather than direct glacial erosion and transport. Sediments are passively transported as talus by the glacier, and a distinct sedimentology can be contrasted with lodgement tills. Medial moraine sediment is derived from a number of sources and is transported on the glacier surface and at depth near the glacier bed--there is no evidence of either textural evolution with increasing distances of glacial transport or enhanced scour of the glacier bed in the vicinity of medial moraines. Particle-size distribution of both medial moraine debris (supraglacial morainic till) and lodgment tills was found to be independent of source rock. A bimodal grain-size distribution widely reported from the analysis of far-traveled Pleistocene tills from the mid-latitudes, reflecting the crushing characteristics of component minerals in the source rock, is not exhibited by tills from Berendon Glacier, which have well-defined lithological sources. This reflects the short distances of debris transport by the glacier and is considered to be typical of other temporal valley glaciers. (Sims-ISWS)
W79-03052

LOESS DEPOSITS ASSOCIATED WITH DESERTS,
Leeds Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W79-03138

CALCULATED SNOWPACK EVAPORATION DURING CHINOOKS ALONG THE EASTERN SLOPES OF THE ROCKY MOUNTAINS IN ALBERTA,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 2D.
W79-03274

WILL DESERTS DRINK ICEBERGS,
P. E. Victor.
UNESCO Courier, February 1978, p 17-22. 5 fig.

Descriptors: *Icebergs, *Sea ice, *Melt water, *Future planning(Projected), *Imported water, *Water transfer, Water sources, Planning, Freshwater, Economic feasibility, Project feasibility.

As world demands for fresh water increase, only two methods stand out as viable alternatives for increasing the present supply of freshwater:desalination of sea water and use of polar ice. Although icebergs contain the purest water on earth, it is estimated that the Antarctic icecap loses more than 10,000 billion cubic meters of ice per year in the form of icebergs which eventually melt and disappear. Much of this loss and perhaps more is regained through accumulated snowfall. It is estimated that an average-sized iceberg would provide 80 billion liters of freshwater, even after a 20 percent loss during transportation. Because icebergs from the north pole are of irregular unstable shape and smaller size, it is likely that the larger and more regular shaped icebergs from Antarctica will be the source of the first transported ice. Economically it is estimated that such a project would cost 60 cents per cubic foot of water as compared to the present 80 cents for the same quantity delivered through desalination. The technical feasibility of iceberg transportation is presently under study by an international scientific commission of ten scientists appointed following an international conference in Iowa in 1977. Research into the questions of iceberg drift, structure, internal stress, erosion, and other practical and theoretical problems is underway, and although many answers are needed, icebergs are a promising and exciting source of future freshwater. (Tickes-Arizona)
W79-03437

FROZEN GROUND PROBABILITIES USING DISCRIMINANT ANALYSIS,
Taiwan Provincial Pingtung Inst. of Agriculture. Dept. of Forestry.
E. S. Yen, M. Molnau, and D. K. McCool.
Paper presented at the 1976 Annual Meeting, American Society of Agricultural Engineers University of Nebraska, Lincoln, June 27-30, 1976. Pa=per No. 76-2085. ASAE St. Joseph, Michigan, 17 p, 7 fig, 2 tab, 13 ref. OWRT A-045-IDA(2), 14-34-0001-6013.

Descriptors: Floods, Rain, *Flood forecasting, *Frozen ground, *Frozen soils, Runoff, Temperature, Classification, Soil temperature, Erosion, Flood damage, *Idaho, Washington, *Discriminant analysis, Freeze-thaw cycles, Palouse Area.

Floods occurring on frozen ground are destructive, both from the point of view of flood severity and erosion hazard. Discriminant analysis was used to classify past runoff events as occurring on frozen or unfrozen ground. For the Greater Palouse area, the average minimum temperature during the freeze period was the single most important variable in classification of events. The method did not appear to work well for a large basin in southern Idaho.
W79-03440

2D. Evaporation and Transpiration

A FIELD STUDY OF THE EFFECT OF WATER DEFICIT ON WATER USE EFFICIENCY,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2I.
W79-03036

CALCULATED SNOWPACK EVAPORATION DURING CHINOOKS ALONG THE EASTERN SLOPES OF THE ROCKY MOUNTAINS IN ALBERTA,
Northern Forest Research Center, Edmonton (Alberta).
D. L. Golding.
Journal of Applied Meteorology, Vol. 17, No. 11, p 1647-1651, November 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Snow cover, *Evaporaton, *Chinook, *Rocky Mountain Region, Moisture uptake, Trees, Ablation, Watershed management, Elevation, Sublimation, *Snowpack elevation, *Alberta Rocky Mountains, *Colorado Rockies, *Central Sierra Snow Laboratory, *Piegon Mountain, Piche atmometer, Tree line, Potential evaporation.

Evaporation from the snowpack during chinooks results in significant moisture loss along the eastern slopes of the Rocky Mountains in Alberta, Canada. From January through March 1976, calculated potential evaporation was as high as 88 mm depth of water above the tree line and 53 mm below tree line. Potential evaporation averaged 1.2 mm/day in 1975, and 2.0 mm/day in 1976. Snowpack evaporation was no greater at the two major gaps in the study area than where no gaps existed. Evaporation was greater above tree line than below tree line, but is was not a function of elevation. For the same 3-month period, there were 24 chinook days in 1975 and 22 in 1976. (Roberts-ISWS)
W79-03274

A HIGH-ACCURACY RECORDING PAN-EVAPORIMETER AND SOME OF ITS POSSIBILITIES,
Institute for Land and Water Management Research, Wageningen (The Netherlands).
G. W. Bloemen.
Journal of Hydrology, Vol. 39, No. 1/2, p 159-173, October 1978. 11 fig, 1 tab, 10 ref.

Descriptors: *Evaporimeters, *Instrumentation, *Evaporation pans, Rainfall, Gravitational water, Plastics, Gaging, Free surfaces, Water loss, Evapotranspiration, *Recording pan-evaporimeter, Plastic dome, Free water surface, Open water evaporation, Shielding, Evaporigraphs.

An instrument was described which was built to record simultaneously pan evaporation and rainfall with a high degree of accuracy. It is in use for routine measurements, but also can be applied to the investigation of some aspects of pan evaporation. In this context, the influence of the depth of the evaporation pan was demonstrated. It was shown that an open pan is unsuitable for gaging evaporation or rainfall on rainy days. An explanation was given of the need of shielding the pan from rainfall with a plastic dome during routine measurements of open-water evaporation. (Roberts-ISWS)
W79-03281

A SOIL MOISTURE BUDGET MODEL ACCOUNTING FOR SHALLOW WATER TABLE INFLUENCES,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-03481

2E. Streamflow and Runoff

A PARAMETRIC MODEL CALIBRATED WITH A PHYSICALLY BASED MODEL FOR RUNOFF PREDICTION FROM UNGAGED STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W79-03003

THE GENERAL LINEAR MODEL WITH PRIOR INFORMATION,
Ireland Office of Public Works, Dublin.
T. Bree.
Journal of Hydrology, Vol. 39, No. 1/2, p 113-127, October 1978. 3 fig, 1tab, 15 ref.

Descriptors: *Unit hydrographs, *Model studies, *Systems analysis, Hydrologic systems, Statistics, Statistical models, Stability, Hydrology, Least squares method, Equations, General linear model, Filtered least squares, Constrained least squares, Linear-equality constraints, Linear-inequality constraints.

Prior information was used to tackle the stability problems encountered in estimating the parameters of the general linear model. Constraints were incorporated into the estimation of a unit hydrograph where the observed sample inputs are highly collinear. The effects of the constrained estimation on the stability of the system and on the statistical properties of the estimator were examined. Constraints for volume, smoothness, nonnegativity, and a monotonic recession were included. These were applied separately and in different combinations, and the results were described. (Lee-ISWS)
W79-03280

FLOOD FREQUENCY ANALYSIS BY POWER TRANSFORMATION,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
S. Chander, S. K. Spolia, and A. Kumar.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14179, p. 1495-1504, November 1978. 4 fig, 5 tab, 11 ref.

Descriptors: *Flood frequency, *Flood plains, *Food routing, Floods, *Frequency analysis, Hydrology, Statistical methods, Equations, Foreign countries, Foreign research, *Statistical analysis, Kurtosis, Transformation.

Flood peaks were estimated using the power transformation method. This method was preferred as it does not require a prior knowledge of the frequency distribution of the population. Annual flood peaks for 15 rivers were analyzed, and it was shown that power transformation is more effective than SMEMAX and log transformations in normalizing the skewed flood distribution. The effect of kurtosis also was taken into account in the estimation of flood peaks. Flood peaks of 100-yr and 200-yr recurrence intervals were computed using power transformation method, and the results were compared with several existing methods. Frequency curves of actual data were plotted, and it was shown that, at higher probability of non-exceedance, curves based on power transformation fit closest to the observed data. (Lee-ISWS)
W79-03287

NEW NONLINEAR SHALLOW-FLOW EQUATIONS WITH CURVATURE,
National Aeronautics and Space Administration, Washington, DC.
For primary bibliographic entry see Field 8B.
W79-03293

EVALUATION OF THERMOGRAPH DATA FOR CALIFORNIA STREAMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. T. Limerinos.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 500, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-66, October 1978. 38 p, 3 fig, 6 tab, 29 ref.

Descriptors: *Water temperature, *Streams, *California, Data collections, Monitoring, Measurement, Evaluation, Statistical methods, Thermographs, Harmonic analysis.

Statistical analysis of water-temperature data from California streams indicates that, for most purposes, long-term operation of thermographs (automatic water-temperature recording instruments) does not provide a more useful record than either short-term operation of such instruments or periodic measurements. Harmonic analyses were made of thermograph records 5 to 14 years in length from 82 stations. More than 80 percent of the annual variation in water temperature is explained by the harmonic function for 77 of the 82 stations. Harmonic coefficients based on 8 years of thermograph record at 12 stations varied only slightly from coefficients computed using two equally split 4-year records. At five stations where both thermograph and periodic (10 to 23 measurements per year) data were collected concurrently, harmonic coefficients for periodic data were defined nearly as well as those for thermograph data. Results of this analysis indicate that, except where detailed surveillance of water temperatures is required or where there is a chance of temporal change, thermograph operations can be reduced substantially without affecting the usefulness of temperature records. (Woodard-USGS)
W79-03336

ANALYSIS OF RUNOFF FROM SMALL DRAINAGE BASINS IN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
G. S. Craig, Jr., and J. G. Rankl.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $2.20. Water-Supply Paper 2056, 1978. 70 p, 31 fig, 15 tab, 24 ref.

Descriptors: *Rainfall-runoff relationships, Small watershed, *Model studies, *Design criteria, *Flood frequency, Flow characteristics, Wyoming, Analytical techniques, Regression analysis, Synthetic hydrology, Hydrographs, Road design, Culverts, Planning.

A flood-hydrograph study has defined the magnitude and frequency of flood volumes and flood peaks that can be expected from drainage basins smaller than 11 square miles in the plains and valley areas of Wyoming. Rainfall and runoff data, collected for 9 years on a seasonal basis (April through September), were used to calibrate a rainfall-runoff model on each of 22 small basins. Long-term records of runoff volume and peak discharges were synthesized for these 22 basins. Flood volumes and flood peaks of specific recurrence intervals (2, 5, 10, 25, 50, and 100 years) were then related to basin characteristics with a high degree of correlation. Flood volumes were related to drainage area, maximum relief, and basin slope. Flood peaks were related to drainage area, maximum relief, basin slope, and channel slope. An investigation of ponding behind a highway embankment, with available storage capacity and with a culvert to allow outflow, has shown that the single fast-rising peak is most important in culvert design. Consequently, a dimensionless hydrography defines the characteristic shape of flood hydrographs to be expected from small drainage basins in Wyoming. For design purposes, a peak and volume can be estimated from basin characteristics and used with the dimensionless hydrograph to produce a synthetic single-peak hydrograph. Incremental discharges of the hydrograph can be routed along a channel, where a highway fill and culvert are to be placed, to help determine the most economical size of culvert if embankment storage is to be considered. (Woodard-USGS)
W79-03345

BANK-FULL DISCHARGE OF RIVERS,
Geological Survey, Denver, CO. Water Resources Div.
G. P. Williams.
Water Resources Research, Vol 14, No. 6, p 1141-1153, December 1978. 2 fig, 3 tab, 51 ref, append.

Descriptors: *Streamflow, *Bank storage, *Flood plans, *Streamflow forecasting, Analytical techniques, Data collections, Gaging stations, Estimating, Equations, Channel morphology, Evaluation, *Bankfull discharge.

Eleven possible definitions of 'bankfull' have been used by various investigators. The active floodplan is the most meaningful bankfull level to the fluvial geomorphologist, whereas the banks of the valley flat are the most important to engineers. Comparison of 16 ways of determining bankfull discharge suggests that bankfull discharge at gaged sites should be obtained from the station's rating curve, where bankfull gage height is determined for a longitudinal profile of the floodplain along the entire reach. At ungaged sites, bankfull discharge can be estimated from the empirical equation of this study or from the Gauckler-Manning equation. Bankfull discharge does not have a common recurrence frequency among the rivers studied. (Woodard-USGS)
W79-03351

2F. Groundwater

GRAVITY ANALYSIS OF THE SUBSURFACE STRUCTURE OF THE UPPER SANTA CRUZ VALLEY, SANTA CRUZ COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
R. W. Parker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 919, Price codes: A08 in paper copy, A01 in microfiche. M. S. Thesis, 1978. 58 p, 17 fig, 4 tab, 46 ref. OWRT A-078-ARIZ(2). 14-34-0001-7005 and -7006.

Descriptors: *Gravity survey, Groundwater, Southwest US, *Arizona, *Santa Cruz Valley(Ariz), Subsurface structure, Alluvium, Groundwater sources.

A gravity survey was conducted in the Upper Santa Cruz Valley, Santa Cruz County, Arizona. Residual gravity anomalies were interpreted to define the subsurface structure and to estimate the water resource potential. A north-south trending fault system with at least 2000 ft of vertical displacement forms the western half of the basin graben structure. The eastern basin boundary is a combination of northwest- and northeast-trending scarps. These scarps are all extensions of or parallel to inferred surface faulty traces. The valley is divided into three major sections, each having a maximum thickness of 4200 ft of alluvium. Alluvium-covered pediments are present on both sides of the valley. The total volume of ground water available in storage in the Upper Santa Cruz Valley is calculated to be 24.3 million acre feet. This total volume of water is not entirely recoverable, because of permeability factors. The alluvium-covered area east of Nogales is not a basin, but rather is a pediment surface. An alluvium-covered area near Ruby is not sufficiently deep to be a major water resource. A two mile wide gravity low just northwest of Nogales contains about 2200 ft of alluvium and is the dominant subsurface feature of the southern third of the valley.
W79-03002

REMOTE SENSING DETECTION OF PERCHED WATER TABLES, A PILOT STUDY,
California Univ., Santa Barbara. Dept. of Geography.
For primary bibliographic entry see Field 4B.
W79-03040

PUBLIC GROUNDWATER SUPPLIES IN PULASKI COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-03045

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, I. A DRAINAGE FORMULA BASED ON A CONSTANT HYDRAULIC HEAD RATIO,
Institute for Land and Water Management Research, Wageningen (Netherlands).
L. F. Ernst.
Journal of Hydrology, Vol. 39, No. 1/2, p 1-30, October 1978. 20 fig, 4 tab, 23 ref.

Descriptors: *Drainage, *Soils, *Sands, *Water tables, *Model studies, Ephemeral streams, Discharge(Water), Equations, Mathematical models, Channels, Geomorphology, Water levels, Cross-sections, Drainage density, Depth, Profiles, Maps, Permeability, Channel morphology, Groundwater, *Channel geometry, *Hydraulic head ratio, Saturated thickness.

In the undulating areas in the eastern part of The Netherlands (elevation 5-30 m above sea level), only the largest drainage channels have a perennial discharge, while the smaller channels have an ephemeral discharge which is considerable in wet periods, but absent in dry periods. The usual drainage formulas cannot be applied satisfactorily in such situations. A considerable improvement can be obtained by taking into account the differences in channel size, the differences in open-water level, and the drain density (length per unit area) of all drains exceeding a certain bottom depth. The intensity of groundwater flow and open-water flow depends on the differences in height between phreatic surface, open-water level, and bottom depth. Although not strictly necessary, a constant ratio has been assumed for these hydraulic head values relative to the channel bottom in order to obtain a simple and still accurate formula for the relation between drain discharge from the area considered and depth of the phreatic surface below ground surface. (See also W79-03277) (Visocky-ISWS)
W79-03276

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, II. THE VARIABLE HYDRAULIC HEAD RATIO,
Institute for Land and Water Management Research, Wageningen (Netherlands).
L. F. Ernst.
Journal of Hydrology, Vol. 39, No. 1/2, p 31-50, October 1978. 14 fig, 3 tab, 13 ref.

Descriptors: *Drainage, *Soils, *Sands, *Water table, *Flow, *Model studies, Water levels, Hydrologic properties, Drainage area, Channel flow, Gradients(Streams), Depth, Channel morphology, Roughness coefficient, Equations, Mathematical models, Groundwater, Hydraulic head ratio, Saturated thickness.

In the preceding paper, a new drainage formula was given, the derivation of which was based mainly on an analysis of the question of how much groundwater flow depends on the permeability of the underlying ground and on the often rather complex geometric properties of the channel network in the drainage basin considered. In this paper, due consideration also was given to the open-water flow, requiring the investigation of other hydrologic properties such as the average relations between drainage area, channel gradient, roughness coefficient, and channel size. The hydraulic head ratio between groundwater flow and open-water flow strongly depends on the bottom depth of the drainage channel and on the depth of the phreatic surface. By substitution of an adequate expression for this hydraulic head ratio into the basic drainage formula, the final expressions could be improved, especially regarding the distribution of the groundwater discharge to the large drainage channels. For wet conditions, this is not of maor significance on the relation between total discharge and groundwater depth. (See also W79-03276) (Visocky-ISWS)
W79-03277

DRAINAGE BY PARTIALLY PENETRATING RECHARGE WELLS IN A LEAKY AQUIFER,
India Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
P. K. Chowdhury, and B. Anjaneyulu.

Journal of Hydrology, Vol. 39, No. 1/2, p. 51-57, October 1978. 5 fig, 2 ref.

Descriptors: *Drainage, *Model studies, *Recharge wells, Drainage wells, Recharge, Wells, Groundwater, Groundwater recharge, Equations, Laboratory tests, Aquifers, *Partial penetrating recharge wells, Leaky aquifer, Penetration ratio, Recharge rate.

Recharge wells can be considered as a possible solution for the drainage of waterlogged areas which have no gravity outlets. A knowledge of the capacity of the recharge wells is useful in estimating the number of wells needed to provide drainage relief to a particular area. Laboratory experiments were conducted on a sand model simulating a leaky artesian aquifer underlying an unconfined aquifer. The unconfined aquifer in the model was overlain by topsoil which was kept ponded to simulate a waterlogged condition. The recharge characteristics of a well partially penetrating the leaky artesian aquifer were studied under different conditions. Based on experimental data, empirical equations were proposed for predicting the recharge rate. (Lee-ISWS)
W79-03278

IDENTIFICATION OF HYDRODISPERSIVE MASS-TRANSFER PARAMETERS IN AQUIFERS BY INTERPRETATION OF TRACER EXPERIMENTS IN RADIAL CONVERGING OR DIVERGING FLOW (IDENTIFICATION DES PARAMETRES TRANSPORT HYDRODISPERSIF DANS LES AQUIFERES PAR INTERPRETATION DE TRACAGES EN ECOULEMENT CYLINDRIQUE CONVERGENT OU DIVERGENT),
Bureau de Recherches Geologiques et Minieres, Orleans (France).
J. P. Sauty.
Journal of Hydrology, Vol. 39, No. 1/2, p. 69-103, October 1978. 20 fig, 1 tab, 34 ref.

Descriptors: *Groundwater movement, *Analytical techniques, *Model studies, *Aquifers, Mathematical models, Analysis, Numerical analysis, Dispersion, On-site investigations, Flow, Tracers, Radial flow, Type curves, Finite difference analysis.

Tracer field measurements on groundwater radial flow yield the mass-transfer parameters economically, when performed on wells already equipped with satellite piezometers. The interpretation of the restitution curve gives rise to some difficulty as there is practically no exact analytical solution to mass transfer radial flow, either diverging (central injection) or converging flow (central pumping and injection of tracer in the satellite piezometer) with continuous or instantaneous injection. This paper presented a simple finite-difference method, free of any numerical dispersion, for the integration of transfer in radial flow equations. It was shown, by calculation of average concentrations on concentric circles, that transversal dispersion has no effect (in the hypothesis of pure hydrodispersive transfer) on the concentration measured in the central well (in the case of central pumping). Programs based on this method allows, with the use of proper dimensionless parameters, the building of type curves for each combination of flow direction and injection mode. It was shown that in each of the four studied cases, there exists an approximate analytical formula which fits the real curves as long as the Peclet number is high enough (over 3). Automatic and manual methods were proposed in order to apply the results to the identification of effective porosity and dispersivity. Several examples of manual identification were given for monolayer aquifer cases, and even for a two-layer case. (Humphreys-ISWS).
W79-03279

A METHOD FOR THE ANALYSIS OF DRAWDOWN FROM MULTIPLE-SOURCE TEST PUMPING,
Southern Water Authority, Eastleigh (England). Directorate of Resource Planning.
For primary bibliographic entry see Field 4B.
W79-03283

SIMULATION OF GROUNDWATER MOUND PERCHING IN LAYERED MEDIA,
Southwestern Great Plains Research Center, Bushland, TX.
A. D. Schneider, and J. N. Luthin.
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 5, p 920-923, 930, September-October 1978. 5 fig, 10 ref.

Descriptors: *Groundwater, *Recharge, *Model studies, *Mathematical models, Artificial recharge, Infiltration, Percolation, Permeability, Impervious soils, Hydraulic conductivity, Steady flow, Groundwater movement, Hydrology, Groundwater recharge, *Perching, *Perched mounds, Groundwater mounds, Perching conditions, Semipervious layers.

Formation of perched groundwater mounds was analyzed through numerical analysis of coupled saturated-unsaturated soil water flow. The unsteady soil water flow equation was solved by the Alternating Direction Implicit (ADI) numerical technique with iteration to remove the nonlinearity. In the numerical model, hydraulic conductivities, recharge rates, and flow domain geometry were varied to observe the important parameters affecting the formation of perched water table. The rate of formation of perched water tables depended primarily on the recharge rate and the saturated hydraulic conductivity of a semi-pervious, subsurface layer. If the ratio of the recharge rate to this hydraulic conductivity was less than 10, a perching condition did not exist. When the ratio ranged from 10 to 25, the perching condition was weak. When the ratio greater than 25, the perching condition was strong. (Sims-ISWS).
W79-03301

INFILTRATION FROM TRIBUTARY STREAMS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
A. D. Randall.
Journal of Research of the U S Geological Survey, Vol 6, No 3, p 285-297, May-June 1978. 6 fig, 2 tab, 19 ref.

Descriptors: *Groundwater recharge, *Infiltration rates, *Surface-groundwater relationships, *Natural recharge, *Streambeds, Permeability, Hydrogeology, Seepage, Water loss, Hydraulic conductivity, Streams, New York, *Susquehanna River basin.

As tributary streams in the Susquehanna River basin in New York leave narrow upland valleys and enter larger valleys floored with permeable stratified glacial drift, they lose water by infilration through streambeds. The infiltration rate is generally slow near the point of entering a larger valley, but farther downstream it is much faster and is approximately constant per unit distance along a given stream. A conservative average value of infiltration rate in the downstream reach is 10 liters per second per 100 meters of channel. Infiltration from these streams is little influenced by stream width, depth, or temperature and seems to be controlled by permeability distribution beyond the streambed in the alluvium or underlying glacial drift rather than by permeability at the streambed. Hydraulic conductivity of earth materials near each of the streams studied was calculated by applying models that describe steady-state saturated flow into isotropic materials with various boundary conditions. Hydraulic conductivities of 4 to 41 meters per day were obtained; 13 meters per day is suggested as a conservative average value for silty gravel alluvium in the Susquehanna River basin. (Woodard-USGS)
W79-03335

THE HYDROTHERMAL SYSTEM OF LONG VALLEY CALDERA, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03343

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCE--MID-ATLANTIC REGION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03344

WELL-RESPONSE MODEL OF THE CONFINED AREA, BUNKER HILL GROUNDWATER BASIN, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03347

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,
Rhode Island Univ., Kingston. Dept. of Geology
R. K. Frohlich.
Water Resources Bulletin, Vol. 14, No. 4, p. 931-941, August 1978. 8 fig, 2 tab, 8 ref.

Descriptors: *Streams, *Channels, *Residual gravity, Hydraulics, *Glacial, Transmissivity, Groundwater resources, Geophysics, Equations, *Rhode Island, Saturated thickness, Bedrock depth.

Buried glacial stream channels contain large and easily accessible groundwater resources. Gravity surveys have been frequently applied for thier location. A gravity survey in the geohydrologically explored Wood River Valley Area of southern Rhode Island shows extreme lows of -2mgals over channel depths of maximal 300 feet. Three gravity profiles were observed in east-west direction across a north-south striking stream channel. The bedrock depth increases rapidly towards the south from 130 to 300 feet. The gravity lows observed across each profile are not related to the bedrock depth but rather to the saturated thickness of the main aquifer and its hydraulic transmissivity. Well logs indicate that the large change of bedrock depth is solely due to an increase of till of low permeability. The volume of the glacial outwash, which is the major groundwater resource, changes little underneath the three profiles. The gravity lows appear to be directly related to the density contrast between glacial outwash and till. The response to the hydraulically more pertinent units renews the interest in the gravity method as it may have a potential to estimate yields of hydrologically complex aquifers. (Bell-Graf)
W79-03417

2G. Water In Soils

STATE-OF-THE-ART SURVEY OF LAND RECLAMATION TECHNOLOGY,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5E.
W79-03025

TRANSIENT AND STEADY FLOW FROM SUBSURFACE LINE SOURCES AT CONSTANT HYDRAULIC HEAD IN ANISOTROPIC SOIL,
Science and Education Administration, Riverside, CA. Salinity Lab.
C. Dirksen.
Transactions of the American Society of Agricultural Engineers, Vol 21, No 5, p 913-919, September-October 1978. 12 fig, 17 ref.

Descriptors: *Soil water, *Soil water movement, *Subsurface flow, *Subsurface irrigation, Infiltration, Hydraulic conductivity, Wetting, Drying, Unsteady flow, Steady flow, Pressure, Moisture content, Drainage, Isotropy, Soil properties, Soil science, Wetting fronts, Hydraulic head.

Water content and pressure head distributions were measured during transient and steady flows from 4 equally spaced line sources maintained at constant hydraulic head in very fine sand in a large laboratory model. Theory and experiment agreed reasonably well. The major differences were a much reduced upward flow and an increased lateral flow below the sources in the experiments. This, and considerations concerning differences in horizontal versus vertical flow between sources, indicated that the soil column exhibited varying degrees of anisotropy, with the hydraulic conductivity being greater horizontally than vertically. After initial wetting, water contents changed little until the wetting fronts reached the bottom. Then the water began to accumulate from the bottom upward. Differences in infiltration rates between sources were predominantly determined by conditions around the sources and were reflected in rates of advance of the wetting fronts, rather than the water content in the regions of uniform flow farther below the sources. Subsequent drainage of the sand provided data for determining the hydraulic conductivity functions and the soil water characteristics. At the same water content, the hydraulic conductivity during wetting was only about half of that during drying. (Sims-ISWS)
W79-03048

THEORY AND SYSTEM OF AUTOMATIC DETERMINATION OF SOIL MOISTURE CHARACTERISTICS AND UNSATURATED HYDRAULIC CONDUCTIVITIES,
Institute for Land and Water Management Research, Wageningen (Netherlands).
D. Boels, J. B. H. M. Van Gils, G. J. Veerman, and K. E. Wit.
Soil Science, Vol 126, No 4, p 191-199, October 1978. 6 fig, 3 tab, 24 ref.

Descriptors: *Soil moisture, *Hydraulic conductivity, *Unsaturated flow, Model studies, Water pressure, Depth, Equations, Darcys law, Measurement, Instrumentation, Data processing, Theoretical analysis, Mathematical models, Infiltration, Laboratory tests, Soil cores.

The moisture characteristic and the unsaturated hydraulic conductivity were calculated from the measured water pressures at different depths in a soil core and the weights during evaporation at the top of the core. The measured water pressure was assumed to represent the mean pressure in a layer of a certain thickness, and the moisture characteristic was assumed to be described with sufficient accuracy by a polynom. The tangent of the polynom in each pressure interval was solved from a set of equations. Assuming that the hydraulic conductivity-water pressure relationship can be described by an exponential relationship with varying constants in the different pressure ranges, the constants can be solved from measured water pressure at two depths and three sequential moments and from the rate of change in water content below some defined depth in the core during two sequential time periods. Up to 10 cores can be handled at the same time. Measuring at a core can be started and stopped at any time. The water pressure at different depths was measured with one pressure transducer, connected with a scannivalve; the weight was measured with a strain-gage load cell; and the data were recorded on a magnetic cassette tape. The recorded data were processed by a computer and stored on a magnetic disc. If the saturated conductivity is relatively high, a steady-state infiltration method is applied to determine the unsaturated hydraulic conductivity at high water contents. (Visocky-ISWS)
W79-03049

IN SITU HYDRAULIC CONDUCTIVITY OF A FRAGIPAN SOIL IN THE SOUTHERN COASTAL PLAINS,
Georgia Univ., Athens.
K. G. Prasad, and H. F. Perkins.
Soil Science, Vol 126, No 5, p 263-268, November 1978. 3 fig, 2 tab, 21 ref.

Descriptors: *Hydraulic conductivity, *Soil types, *Coastal plains, Land use, Perched water, Permeability, Root development, Soil properties, Porosity, Bulk density, Soil horizons, Equipment, Drainage, *Fragipan, In-situ measurement.

More than 250,000 ha of soils having a fragipan or fragic properties occur in the Southern Coastal Plains Soil Province. These soils have moderate to severe land use restrictions, partially due to perched water, slow permeability, and restricted root growth. The Cowarts soil (Fragic Paleudults; fine-loamy, siliceous, thermic family), which is developed from marine sediments, was selected to determine in situ hydraulic conductivities and related hydrological properties. The moderately well-expressed fragipan has higher bulk density, less pore space, smaller pores, less available water, and lower hydraulic conductivity values than horizons above or below the pan. With an increase in hydraulic head, an increase in hydraulic conductivity was less in the fragipan than in associated horizons. (Visocky-ISWS)
W79-03050

SPATIAL VARIABILITY OF SOIL WATER PROPERTIES IN TROPICAL SOILS OF NIGERIA,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
O. Babalola.
Soil Science, Vol 126, No 5, p 269-279, November 1978. 4 fig, 7 tab, 14 ref.

Descriptors: *Soil water, *Tropical regions, *Soil properties, *Spatial distribution, Nuclear meters, Hydraulic conductivity, Moisture content, Bulk density, Soil types, Infiltration, Frequency curves, Equations, On-site investigations, Drainage, *Nigeria.

The internal drainage technique, which employs a neutron moisture meter and tensiometers, was used to evaluate the spatial variability of soil water properties of a 0.34 and 91.6-ha field. The precision with which the soil hydraulic conductivity K, as a function of moisture content theta, could be obtained for a single soil type in the field also was determined. High variability in soil physical properties, such as percent gravel, sand, silt, and clay, and bulk density, resulted in a high variability in soil water retention characteristics and hydraulic conductivity. The coefficients of variability of these soil properties were only slightly higher for the 91.6-ha farm area than for the 0.34-ha area, consisting of one soil type on a nearly level topography. Although the spatial variability of soil water content was relatively low at any time and any depth after cessation of infiltration, ranging from 2.48 to 12.06%, the hydraulic conductivity values were far more divergent, having coefficients ranging from 47.6 to 146.9%. Steady-state moisture content and hydraulic conductivity were normally and log-normally distributed, respectively. The magnitude of soil water flux at any depth was predicted with some success, using a simple prediction equation that requires a knowledge of saturated hydraulic conductivity and the slope of the K (theta) curve near saturation. (Visocky-ISWS)
W79-03051

DERIVATION OF EQUATIONS FOR VARIABLE RAINFALL INFILTRATION,
Colorado State Univ., Fort Collins. Engineering Research Center.
H. J. Morel-Seytoux.
Water Resources Research, Vol. 14, No. 4, p 561-568, August 1978. 7 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Infiltration, *Rainfall, *Ponding, *Mathematical models, Model studies, Equations, Theoretical analysis, Moisture content, Soil water, Porous media, Soils, Hydrology, Ponding time, Variable rainfall.

Formulas were derived for prediction of ponding time and cumulative infiltration following ponding under a condition of piecewise variable and even intermittent rainfall. The derivations do not assume immediate saturation at the surface or a piston displacement of air by water; they include the viscous flow of air. The results were compared with experimental data of James and Larson for two conditions: constant rainfall and intermittent rainfall. The proposed formulas are simple to use, requiring no complex solution of a partial or even an ordinary differential equation. The numerical calculations presented in the paper were performed with a small pocket calculator. The agreement with experimental data is good. (Sims-ISWS)
W79-03095

ARSENIC STABILITY IN CONTAMINATED SOILS,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W79-03099

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME IV. APPENDIX C: HYDROLOGY: APPENDIX D: GEOLOGY, SOILS AND MATERIALS.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03167

NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,
Nova Scotia Technical Coll., Halifax. Dept. of Bio-Resources Engineering.
For primary bibliographic entry see Field 5D.
W79-03178

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, I. A DRAINAGE FORMULA BASED ON A CONSTANT HYDRAULIC HEAD RATIO,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2F.
W79-03276

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, II. THE VARIABLE HYDRAULIC HEAD RATIO,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2F.
W79-03277

AN AUTOMATIC SCANNING RECORDING TENSIOMETER SYSTEM,
Bristol Univ. (England). Dept. of Geography.
T. H. L. Williams.
Journal of Hydrology, Vol. 39, No. 1/2, p 175-183, October 1978. 3 fig, 6 ref.

Descriptors: *Soil moisture, *Soil physics, Soil science, Soil water movement, Temperature, *Tensiometers, Effects, Equations, Automation, Testing, *Automatic tensiometer system, Response time, and the effects of temperature on the system were discussed.

A rapid-response, automatic tensiometer scanning system was developed to provide continuous on-site recording of soil moisture conditions. The system employs a 24-way fluid wafer switch to connect 22 tensiometer units sequentially to a pressure transducer, registering on a chart recorder. Constructional details of the system were given at the response time, and the effects of temperature on the system were discussed. (Lee-ISWS)
W79-03282

BROMACIL IN LAKELAND SOIL GROUND WATER,
Southeastern Forest Experiment Station, Marianna, FL.
For primary bibliographic entry see Field 5B.
W79-03291

MOTTLING IN SOIL PROFILES CONTAINING A COARSE-TEXTURED HORIZON,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.

B. E. Clothier, J. A. Pollock, and D. R. Scotter.
Soil Science Society of America Journal, Vol. 42, No. 5, p 761-763, September-October 1978. 3 fig, 10 ref.

Descriptors: *Soil texture, *Drainage, *Model studies, Mathematical models, *Soil horizons, *Soil profiles, Soil properties, Hydraulic conductivity, Soil water, Soil water movement, Iron, Manganese, Chemical precipitation, Soil science, *Soil mottling.

Mottling often characteristically occurs in fine-textured soil just above an underlying coarse-textured layer. Interpretation of such mottling as representing a normal drainage impedance is misleading as a perched or groundwater table may never occur in the profile. In this paper, a simple soil water drainage model was discussed that aids interpretation of the pattern of mottling in a soil horizon above a coarse-textured layer. Also, the influence of various soil physical parameters on mottling phenomena was alalyzed, suggesting that the more coarse-textured the underlay the greater the propensity to mottle. The tendency to mottle was shown to be greatest in the soil immediately above the coarse-textured layer. The model was applied to the naturally layered Manawatu fine sandy loam, a Dystric Fluventic Eutrochrept. (Sims-ISWS).
W79-03300

SIMULATION OF GROUNDWATER MOUND PERCHING IN LAYERED MEDIA,
Southwestern Great Plains Research Center, Bushland, TX.
For primary bibliographic entry see Field 2F.
W79-03301

SOIL MOISTURE DETERMINATION USING MICROWAVE RADIATION,
Connecticut Agricultural Experiment Station, New Haven.
L. Hankin, and B. L. Sawhney.
Soil Science, Vol. 126, No. 5, p 313-315, November 1978. 1 fig, 4 tab, 5 ref.

Descriptors: *Soil moisture, *Moisture content, *Laboratory tests, *Microwaves, Heating, Drying, Soils, Soil water, Soil types, Analytical techniques, Soil analysis, Soil science, Microwave ovens.

The advantages of microwave treatment over conventional heating are simplicity of operation and a saving of time. A simplified method for soil moisture determination using ordinary filter paper folded into cups for holding the sample was described. The microwave source was a microwave oven rated to deliver 625 W (high power) at a wavelength of 2450 MHz. A filter paper cup, including another piece of tape to seal the top, was weighted, and about a 10-g sample was placed in it and weighed. The cup containing the soil sample was placed in the center of the floor of the microwave oven, and the cup and contents were treated for 3 min. The filter paper cup then was turned over and treated for an additional 3 min. After the cup was removed from the oven, air was allowed to flow over it for 30 sec in a fume hood or with a fan. The cup and contents then were weighed, and the percent moisture was calculated. Soil moisture determinations also were made by the conventional procedure of drying samples at 110C for 18 h. The use of a microwave oven as the heat source to determine the moisture content of soils was found to be speedy and satisfactory. (Sims-ISWS).
W79-03303

RELATIONSHIP TO EXTRACTABLE SOIL MANGANESE TO SOIL PROPERTIES,
Georgia Univ., Experiment. Dept. of Agronomy.
L. M. Shuman, and O. E. Anderson.
Soil Science Society of America Journal, Vol. 42, No. 4, p 666-667, July-August, 1978. 2 tab, 8 ref.

Descriptors: *Manganese, *Soil chemical properties, Soil physical properties, Ammonium compounds, Organic matter, Cation exchange, Greenhouses, *Soil chemistry.

In a greenhouse experiment eight Southeastern soils were amended to give pH levels of 4.8, 5.8, and 6.8 and were treated with 0, 25, and 50 ppm Mn. After growing wheat (Triticum aestivium L.) for 40 days, the soils were extracted for Mn using six extractants: H20, neutral 1N NH40Ac (with and without 0.2% hydroquinone), 'double acid', diethylenetriaminepentaacetic acid (DTPA) and ethylenediaminedi-o-hydroxyphenyl-acetic acid (EDDHA). Except for the low-Mn soils, greater differences in extractable Mn were observed among soil types and soil pH levels than among Mn rates. Extractable Mn was correlated with soil clay content and total soil Mn. Organic matter content with a narrow range from 1.0 to 2.9%, silt content and cation exchange capacity (CEC) were not correlated with extractable Mn. The extractable Mn decreased as soil pH increased for the H20, NH40Ac alone, and DTPA extractants making them preferable for predicting soil Mn availability since higher pH causes Mn to be less available to the plant. (Skogerboe-Colorado State)
W79-03360

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 5B.
W79-03364

HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MEDIA: GENERALIZED MACROSCOPIC APPROACH,
Colorado State Univ., Fort Collins.Engineering Research Center.
Y. Mualem.
Water Resources Research, Vol. 14, No. 2, p 325-334, April, 1978. 2 fig, 5 tab, 41 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Porous media, Permeability, Moisture content, Statistical methods.

The macroscopic approach which yields the power function relationship between the relative permeability (K sub r) and the effective saturation (S sub e), K sub r = (S sub e) to the nth power, was generalized to allow n to vary with the soil type. The proposed macroscopic approach was verified by the experimental results of 50 soils. It rendered the power function model of (relative permeability - acutal volumetric water content) a flexibility it lacked before by relating the power n to the energy per unit volume required to drain a saturated soil to the wilting point. The proposed model is shown to be an efficient tool for the prediction of the hydraulic conductivity. (Skogerboe-Colorado State)
W79-03397

MICROBIAL ASPECTS OF THE VOLATILE LOSS OF APPLIED MERCURY (II) FROM SOILS,
Oregon State Univ., Corvallis. Dept. of Soil Science; and Oregon State Univ., Corvallis. Dept. of Agriculture Chemistry.
For primary bibliographic entry see Field 2K.
W79-03419

POTENTIAL USE OF FINELY DISINTEGRATED IRON PYRITE IN SODIC AND IRON-DEFICIENT SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
P. L. G. Vlek, and W. L. Lindsay.
Journal of Environmental Quality, Vol. 7, No. 1, p 111-114, January-March, 1978. 3 fig, 3 tab, 15 ref.

Descriptors: *Pyrite, *Oxidation, Sulfur, Fertilizers, *Mine wastes, Soil amendments, *Colorado.

The rate of chemical oxidation of iron pyrite in water was measured as a function of particle size. Reducing the particle size greatly increased the rate of oxidation. For pyrite > 250 microns, the pH of the solution leveled off at 5 after 6 hours while the clay size pyrite dropped to pH 4 within 24 hours. In these studies, pyrite was applied at 1% initially with an additional 1% after 1 month to a slightly sodic, iron-deficient, loamy sand soil from Colorado. The soil/water ratio was 1:2. When clay size pyrite was used, the pH of the soil decreased from 8.3 to 7.8 after 1 mo and to 5.7 after 2 mo. The coarser pyrite decreased the pH only slightly. No significant change in the composition of exchangeable ions occurred during the first month, but the composition had changed sufficiently after 2 mo to flocculate the clay. The DTPA-extractable iron increased from 1.5 to 64 ppm for the finest pyrite treatment during 1 mo, copper doubled, and manganese quadrupled during this period. Finely disintegrated pyrite may be useful for reclaiming slightly sodium-affected soils or for providing slow release available iron. (Skogerboe-Colorado State)
W79-03423

THE MECHANISM OF SULFATE ADSORPTION ON IRON OXIDES,
Griffth Univ., Nathan (Australia). School of Science.
For primary bibliographic entry see Field 2K.
W79-03428

THE ACETYLENE INHIBITION METHOD FOR SHORT-TERM MEASUREMENT OF SOIL DENITRIFICATION AND ITS EVALUATION USING NITROGEN-13,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 2K.
W79-03429

SALT OUTFLOWS FROM NEW AND OLD IRRIGATION LANDS,
Snake River Conservation Research Center, Kimberly, ID.
For primary bibliographic entry see Field 3C.
W79-03442

A SOIL MOISTURE BUDGET MODEL ACCOUNTING FOR SHALLOW WATER TABLE INFLUENCES,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
R. G. Stuff, and D. F. Dale.
Soil Science Society of America Journal, Vol. 42, No. 4, p 637-643, July-August, 1978. 9 fig, 1 tab, 15 ref, 10 equ.

Descriptors: *Soil moisture , *Evapotranspiration, *Capillary water, Water balance, Field capacity, *Moisture deficit, Computer models, *Water table.

Soil moisture balance programs developed on well-drained soils were found to be unsatisfactory for a soil underlain by shallow water tables, a condition typical of about 9 million acres of cropland in Indiana. Capillary rise past a 105-cm root zone boundary was estimated as the difference between estimated evapotranspiration (ET) and chages in soil moisture under corn (Zea mays L.) on a tile-drained Typic Argiaquoll at West Lafayette, Ind. during three growing seasons, 1971-1973. Capillary water was found to supply an average of 27% of the ET in periods with little or no precipitation. Computer model estimates showed caillary water to furnish about 17% of the total ET over a 100-day period from 49 days before silking to 50 days after. The derived relationships with those obtained from literature sources and assumptions regarding runoff and recharge were programmed in a computer model for simulating the daly moisture status and changes in the corn root zone. Model inputs were pan evaporation, precipitation, soil moisture characteristics, corn silking date, and initial soil moisture conditions. The model was found to closely track measurements of both soil moisture and water table depths in four independent seasons: early and late plantings in 1970 and 1974. (Skogerboe-Colorado State)
W79-03481

DETERMINING SOIL GYPSUM CONTENT AND EXPRESSING PROPERTIES OF GYPSIFEROUS SOILS,
National Soil Survey Lab., Lincoln, NE.
R. E. Nelson, L. C. Klameth, and W. D. Nettleton.
Soil Science Society of America Journal, Vol 42, No 4, p 659-661, July-August, 1978. 1 fig, 2 ref, 18 equ.

Descriptors: *Gypsum, Sulfates, Soil water, *Soil chemical properties, Soil tests, *Soil chemistry.

The standard method for measuring the gypsum content of soils is a lengthy one, partly because of the presence of Na and Mg sulfates in most gypsic horizons, and partly because of the difficulty in dissolving all the gypsum in the sample. A more rapid method, sufficiently accurate for taxonomic uses, has been developed and is based on loss of crystal water of gypsum upon heating to 105C. Percent gypsum, calculated on an oven-dry weight basis from loss of crystal water, equals 1.038 x percent gypsum by the standard chemical method + 0.17. The standard error of estimate for the new methods is plus or minus 1.8% gypsum. Equations are given for expressing properties of gypsiferous soils on an oven-dry + crystal water of gypsum weight basis. (Skogerboe-Colorado State)
W79-03491

2H. Lakes

UTILITY LINE SITING AND WETLAND PRESERVATION,
Wisconsin Univ. Madison. Land Resources.
For primary bibliographic entry see Field 4C.
W79-03090

CHANGES IN THE AQUATIC MACROPHYTE FLORA OF WHITEWATER LAKE NEAR SUDBURY, ONTARIO FROM 1947 TO 1977,
Guelph Univ., (Ontario). Dept. of Botany and Genetics.
For primary bibliographic entry see Field 5C.
W79-03177

ECOLOGICAL STUDIES ON INDONESIAN LAKES, THE MONTANE LAKES OF BALI,
Cambridge Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03180

DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON IN 153 LAKES, RIVERS, AND POOLS IN THE NORTHWEST TERRITORIES,
Canada Environmental Protection Service, Yellowknife (Northwest Territories).
For primary bibliographic entry see Field 5C.
W79-03185

ORGANIC CARBON-A NONSPECIFIC WATER QUALITY INDICATOR FOR LAKE SUPERIOR,
Minnesota Univ., Minneapolis. Dept. of Civil Mineral Engineering.
For primary bibliographic entry see Field 5A.
W79-03186

ENERGY FLUX AND WAVE ACTION IN GRAVITY WAVES PROPAGATING ON A CURRENT,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W79-03294

THE DAMPING OF SOLITARY WAVES,
Coastal and Marine Engineering Research Inst. Haifa (Israel).
For primary bibliographic entry see Field 8B.
W79-03295

EFFECT OF ORGANIC COLOR AND TURBIDITY OF SECCHI DISK TRANSPARENCY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
P. L. Brezonik.
Journal of the Fisheries Reseearch Board of Canada, Vol. 35, No. 11, p 1410-1416, November 1978. 4 fig, 2 tab, 18 ref.

Descriptors: *Secchi disks, *Turbidity, *Color, *Florida, Chlorophyll, Plankton, Lakes, Trophic level, Light penetration, Regression analysis, Data processing, Mathematical models, Limnology, *Organic color, *Transparency.

Secchi disk transparency in lakes is a function not only of the turbidity caused primarily by plankton, but also of the organic color level in the water. Multiple regression analysis of data from 55 Florida lakes yielded a close-fitting equation of the type $1/SD = a(Color) + b(Turbidity) + c$. The statistical relationships between inverse transparency and chlorophyll a and between log transparency and log chlorophyll a exhibited greater scatter. Experiments in which concentrated solutions of humic substances were added to a large plastic 'limno-bag' verified the linear relationship between 1/SD and color content, but yielded a different slope than that obtained by regression analysis. The maximum possible transparency (assuming zero turbidity) was similar for both the experimental and regression relationships at color levels above 50 platinum (Pt) units, but increasingly divergent results were predicted by the two approaches at lower color levels. At a color of 100 Pt units, the maximum Secchi disk transparency is about 2.4-2.8 m. Because of the crudeness of transparency measurements, use of the above regression equation to compute transparencies from measured turbidities appeared to be more reliable than use of the experimentally derived equation. (Sim-ISWS).
W79-03304

CONIFER NEEDLE PROCESSING IN A SUBALPINE LAKE,
Washington Univ., Seattle. Collo of Forest Resources.
For primary bibliographic entry see Field 5B.
W79-03400

LAKE QUALITY DISCRIMINANT ANALYSIS,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 5C.
W79-03422

WATER + WEEDS + HEAT = NOVEL EXPERIMENTATION,
Beak Consultant Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 5G.
W79-03456

EVIDENCE OF RESISTANCE TO METALS IN LARVAE OF THE MIDGE CHIRONOMUS TENTANS IN A METAL CONTAMINATED LAKE,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W79-03464

TWO TYPES OF FISH ATTRACTORS COMPARED IN LAKE TOHOPEKALIGA, FLORIDA,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
For primary bibliographic entry see Field 8I.
W79-03469

BASIC ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEMS OF THE NORTHWEST OF THE EUROPEAN PART OF THE USSR,
Akademiya Nauk SSSR, Leningrad. Inst. of Lake Management.
For primary bibliographic entry see Field 5C.
W79-03478

SOME PATTERNS OF CHANGE IN LACUSTRINE ECOSYSTEMS UNDER ANTHROPOGENIC INFLUENCE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W79-03479

2I. Water In Plants

A FIELD STUDY OF THE EFFECT OF WATER DEFICIT ON WATER USE EFFICIENCY,
Kansas Water Resources Research Inst., Manhattan.
E. T. Kanemasu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 761, Price codes: A04 in paper copy, A01 in microfiche. Contribution No 201, October 1978. 49 p. OWRT A-085-KAN(1). 14-34-0001-7036.

Descriptors: *Water stress, Rainout shelter, Canopy temperature, *Water utilization, *Transpiration, *Photosynthesis, *Sorghum, *Soybeans.

In order to study water deficits in the field, it is necessary to control natural precipitation without significantly modifying the other meteorological parameters (solar radiation, temperature, humidity and wind speed). A large (40' x 40') rainout shelter was constructed which automatically covered the experimental plots during periods of rainfall. Experiments were conducted on well-watered and stressed sorghum and soybeans. On both crops, photosynthesis and transpiration were reduced when the available soil moisture decreases below 35% of the maximum available water. Canopy temperatures of sorghum and soybean under well-water conditions were near 33 and 31C. Leaf temperature increased over air temperature during water stress periods.
W79-03036

LOCALIZATION OF CHITIN IN ALGAL AND FUNGAL CELL WALLS BY LIGHT AND ELECTRON MICROSCOPY,
Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W79-03111

FACTORS REGULATING THE DISTRIBUTION AND POPULATION DYNAMICS OF THE AMPHIPOD GAMMARUS PALUSTRIS IN AN INTERTIDAL SALT MARSH COMMUNITY,
Maryland Univ., College Park. Dept. of Zoology.
R. F. Van Dolah.
PhD Dissertation, 1977. 101 p.

Descriptors: *Salt marshes, Aquatic population, *Amphipods, Distribution, *Gammarus palustris, Aquatic plants.

Seasonal changes in the intertidal distribution, abundace, and population dynamics of the epifaunal amphipod Gammarus paustris were studied in salt marshes bordering two estuaring rivers located in the Chesapeake Bay. In both rivers, low amphipod densities occurred during the winter corresponding with a subtidal migration. Migrations did not account for the low numbers observed at other times and an examination of the life cycle of this species as well as an egg-ration analysis of the populations indicated that low densities during the summer or late summer and fall were not due solely to life cycle events. Insufficient tolerance to freezing temperatures was postulated as the reason for the distributional shift to subtidal areas during the winter. Amphipod distribution within the intertidal zone at other times of the year was highly correlated with Spartina density. Birth rate and average brood size declined during the early summer as a result of natural adult female

mortality an a decreased proportion of ovigerous to non-ovigerous females. The average brood size/ovigerous female did not declin significantly throughout the reproductive period indicating that food limitation did not induce the observed summer decline in amphipod abundance. (Steiner-Mass)
W79-03116

A COMPREHENSIVE STUDY OF SUCCESSIONAL PATTERNS OF PLANTS AND ANIMALS AT UPLAND DISPOSAL AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 5E.
W79-03257

FIELD MEASURED AND SIMULATED CORN LEAF WATER POTENTIAL,
Agricultural Research Service, Morris, MN.
D. C. Reicosky, and J. R. Lambert.
Soil Science Society of America Journal, Vol. 42, No. 2, p 221-228, March-April, 1978. 6 fig, 2 tab, 27 ref.

Descriptors: *Sweet corn, Simulation analysis, *Moisture content, *Moisture tension, Microenvironment, Stemflow, Leaves.

The dynamic nature and magnitude of field-measured leaf water potential for sweet corn (Zea mays L.) was compared with that predicted by the model TROIKA. Some plant parameters for corn were estimated from the literature and field observation, whereas the moisture desorption curve and the hydraulic conductivity-water content relationship were determined for the Varina sandy loam. Leaf water potential-relative water content relationships were determined in the greenhouse. Hourly microclimate data were used as input to the model, and the predicted and observed values of leaf water potential were compared for 3 days during the growing season. Generally, the model predicted leaf water potential with reasonable accuracy throughout the day. Water potential gradients in the soil were small as compared with those across the root and across the stomatal opening. (Skogerboe-Colorado State)
W79-03361

UPTAKE OF CADMIUM FROM PHOSPHATE FERTILIZERS BY PEAS, RADISHES, AND LETTUCE,
Corvallis Environmental Research Lab., OR.
J. O. Reuss, H. L. Dooley, and W. Griffis.
Journal of Environmental Quality, Vol. 7, No. 1, p 128-133, January-March 1978. 2 fig. 7 tab, 6 ref.

Descriptors: Heavy metals, *Phosphates, Fertilizers, *Cadmium, *Absorption, *Radishes, *Peas, *Lettuce.

Cadmium uptake from phosphate fertilizers by radish, lettuce, and garden peas was investigated in the greenhouse. Reagent grade mono-calcium phosphate and concentrated superphosphate (CSP) were used as a P source on a coarse-textured acid soil. The effect of mono-calcium phosphate compared with that of CSP on radish, lettuce and peas was nonsignificant. On a medium-textured calcareous soil the use of this CSP increased the Cd content of radish tops by about 80% and that of lettuce by 50%. The effect on radish roots from calcareous soil was nonsiginficant. Pea seeds and foliage on this soil were below our Cd detection limit. Uptake on both soils was a linear function of the Cd content of the fertilizer. In the acid soil, spot placement of fertilizer in comparison to mixing it with the soil resulted essentially the same Cd uptake from CSP fertilizer. Spot placement of Di-ammonium phosphate (DAP) almost completely eliminated Cd uptake from the fertilizer. In the calcareous soil spot placement increased Cd uptake from the CSP fertilizer but slightly depressed uptake from DAP. (Skogerboe-Colorado State)
W79-03424

POTASSIUM UPTAKE BY ONION ROOTS CHARACTERIZED BY POTASSIUM/RUBIDIUM RATIO,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
V. C. Baligar, and S. A. Barber.
Soil Science Society of America Journal, Vol. 42, No. 4, p 618-622, July-August, 1978. 8 tab, 15 ref, 3 equ.

Descriptors: Cations, *Cation exchange, *Potassium, *Onions, *Sweet corn, Selectivity, Diffusivity, *Root systems.

A common belief is that plant roots absorb cations from the solution phase of the soil. Experiments with corn (Zea mays L.) using K./Rb ratio to evaluate the source of K and Rb absorbed indicated the plant roots absorbed these ions in the ratio of exchangeable K and Rb. The objective of this research was to study the source of K and Rb absorbed from soil by onion (Allium cepa) roots since they do not have root hairs and this may influence the uptake mechanism. Onions absorbed K/Rb with a ratio which was intermediate between the ratio of exchangeable K and Rb and the ratio of these cations in solution. In comparison with corn, onions absorbed K at one-third the rate, but absorbed water three times faster so that mass flow contributed a greater proportion of K absorbed by onions than that by corn. This, rather than differences in root hairs may be the reason for the observed differences in K uptake between corn and onions. (Skogerboe-Colorado State)
W79-03431

2J. Erosion and Sedimentation

SIGNIFICANCE OF TURBIDITY FOR QUALITY ASSESSMENT OF AGRICULTURAL RUNOFF AND IRRIGATION RETURN FLOW,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W79-03006

SEDIMENTOLOGY OF MEDIAL MORAINES ON BERENDON GLACIER, BRITISH COLUMBIA, CANADA: IMPLICATIONS FOR DEBRIS TRANSPORT IN A GLACIERIZED BASIN,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2C.
W79-03052

RESPONSIVENESS OF SOIL EROSION LOSSES IN THE CORN BELT TO INCREASED DEMANDS FOR AGRICULTURAL PRODUCTS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W79-03064

LOESS DEPOSITS ASSOCIATED WITH DESERTS,
Leeds Univ. (England). Dept. of Civil Engineering.
I. J. Smalley, and D. H. Krinsley.
Catena, Vol. 5, p. 53-66, 1978. 70 ref.

Descriptors: *Loess, *Sediment distribution, *Sierozems, Soil types, Silts, Wind erosion, Water erosion, *Glacial sediments, Carbonates, Clay minerals, Silicates, Sedimentary petrology, Weathering, Geomorphology, Geophysics.

Loess deposits of the world are divided by nature and distribution into warm-desert loess and cold-glacial loess. Although glacial derived loess is well known by composition and origin, understanding of desert loess has remained somewhat speculative. The purpose of this analysis is to solve some of these problems associated with the nature and formation of true desert loess deposits. Separate analysis of desert loess in China, the Mediterranean, the Middle East, and central Asia reveals that although transported from adjacent deserts, the loess particles themselves had their origins in glacial grinding and cold weather processes in adjacent mountains. Accordingly, deserts not close to such mountainous areas, such as the Sahara and Australian deserts, are lacking in loess deposits. While some researchers have then proposed the glacial and cold weather origin of all loess, it is apparent from recent studies that the weathering of igneous rock is the origin of some desert loess. Additionally, a loess is found in the Persian-Arabian Gulf area which can be distinguished from the normal loess by its fundamental coarse silt composition of carbonate, as opposed to the post depositional carbonate accumulation of the more commonly found loess. It is pointed out, however, that despite these recent studies, the great majority of the world's loess deposits are derived from cold weather and glacial erosion. (Tickes-Arizona)
W79-03138

PLANT INDICATORS OF SLOPE INSTABILITY,
Washington State Univ., Pullman. Dept. of Forestry and Range Management.
For primary bibliographic entry see Field 4D.
W79-03285

HYDROLOGIC AND GEOMORPHIC DATA FROM THE PICEANCE BASIN, COLORADO, 1972-77,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03359

THE KINEMATICS OF BREAKING WAVES IN THE SURF ZONE,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 2L.
W79-03379

HARVESTING EFFECTS ON SOIL AND WATER IN THE EASTERN HARDWOOD FOREST,
Northeastern Forest Experiment Station, Parsons, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W79-03412

EFFECTS OF SEDIMENT ADDITION ON MACROBENTHIC INVERTEBRATES IN A NORTHERN CANADIAN RIVER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W79-03470

2K. Chemical Processes

HYDROLOGIC AND CHEMICAL ANALYSES OF THE OLD TOWN AND HAMPDEN, MAINE WELL FIELDS WITH REGARD TO THE HIGH IRON AND MANGANESE CONCENTRATION PROBLEM,
Maine Univ. at Orono. Dept. of Civil Engineering.
C. N. Blanchard, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 741, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, August 1978. 144 p, 18 fig, 13 tab, 35 ref, 4 append. OWRT A-036-ME(1).

Descriptors: Aquifers, *Iron, *Manganese, Pumping, Recharge, *Water chemistry, *Water wells, Groundwater, *Maine, Pollutant identification, Glaciated terrains.

An investigation of the well fields belonging to the water districts of Old Town and Hampden, Maine was undertaken to understand the mechanisms that cause high concentrations of dissolved Fe and Mn in water pumped from glaciated terrains. Parameters measured in water samples from the well fields were temperature, pH, Eh, alkalinity, O2, CO2, HCO3, sigma Fe, sigma Mn, Ca, Na, Mg, K,

Cl, SO4, and H4SiO4 concentrations. Chemical data indicated that the Old Town and Hampden aquifers (eskers) have considerable recharge from the Stillwater River and the Souadabscook Stream, respectively. Water pumped from production wells was a mixture of 'young' (contains dissolved O2) and 'old' (O2 depleted, generally deeper, and having been in contact with aquifer material and bedrock for a longer period of time) water. The proportion of young to old water pumped appeared to determine the concentrations of dissolved Fe and Mn. This ratio was influenced by pumping rate, well depth and screen length, location and type of recharge (river and/or precipitation), and the aquifer material.
W79-03038

AN AUTOMATED DETERMINATION OF LOW REACTIVE PHOSPHORUS CONCENTRATIONS IN NATURAL WATERS IN THE PRESENCE OF ARSENIC, SILICON AND MERCURIC CHLORIDE,
Department of Scientific and Industrial Research, Taupo (New Zealand), Ecology Div.
For primary bibliographic entry see Field 5A.
W79-03047

CHEMICAL COMPOSITION OF ACID PRECIPITATION IN PASADENA, CALIF.,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering Science.
For primary bibliographic entry see Field 5A.
W79-03054

RECENT DEVELOPMENTS IN ATMOSPHERIC CHEMISTRY,
Cambridge Univ. (England). Dept. of Physical Chemistry.
B. A. Thrush.
Nature, Vol 276, No 5686, (Climatology Supplement), p 345-348, November 23, 1978. 3 fig, 19 ref.

Descriptors: *Atmosphere, *Chemistry, *Chemical properties, Air pollution, Air pollution effects, Chemical reactions, Ozone, Oxygen, Oxides, Hydrogen compounds, Chemicals, Ultraviolet radiation, Carbon dioxide, Weather, Meteorology, Tropospheric chemistry, Stratospheric chemistry, Atmospheric chemistry, Carbon monoxide.

The chemistry of the atmosphere was a largely neglected topic until the last decade, during which concern about pollution has produced a flurry of activity. The processes which may deplete the relatively small amount of ozone in the stratosphere which protects us from harmful UV light have much in common with those in the Los Angeles-type smog which generate ozone and other oxidants. Such systems involve chain reactions in which free radicals such as HO, HO2, and ClO can carry out a chemical conversion process (ozone to oxygen) many times before they are destroyed. Recent research showed that nitrogen oxides from the exhausts of supersonic aircraft or derived from increased use of nitrogenous fertilisers will have little effect on stratospheric ozone, but the potential effects of chlorine compounds, such as aerosol propellants, require careful examination. In contrast, the oxidation of carbon monoxide is now thought to be a major source of ozone in the lower atmosphere. (Sims-ISWS)
W79-03072

DONNAN DIALYSIS MATRIX NORMALIZATION FOR CATHODIC STRIPPING VOLTAMMETRY,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.
W79-03103

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 5A.
W79-03181

PERFORMANCE EVALUATION OF GUILDLINE MODEL 8400 LABORATORY SALINOMETER,
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 7B.
W79-03270

A HYDROLOGIC STUDY OF WATER WELL YIELDS AND GROUNDWATER QUALITY RELATED TO STRATIGRAPHIC AND STRUCTURAL SETTINGS IN WESTERN JACKSON COUNTY, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5A.
W79-03306

WARM SPRINGS, SOUTH ISLAND, NEW ZEALAND, AND THEIR POTENTIALS TO YIELD LAUMONTITE,
Geological Survey, Menlo Park, CA. Water Resources Div.; and Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
I. Barnes, C. J. Downes, and J. R. Hulston.
American Journal of Science, Vol. 278, p. 1412-1427, December 1978. 2 fig, 5 tab.

Descriptors: *Thermal springs, *Chemical reactions, *Geochemistry, *Zeolites, *Carbon dioxide, Meteoric water, Ionization, Calcite, Water sampling, Analytical techniques, Chemical analysis, Geology, Metamorphic rocks, *New Zealand, Laumontite.

Warm springs (40 to 65C) of South Island, New Zealand, are all supersaturated with laumontite and with few exceptions are either in equilibrium with or are unsaturated with calcite and albite. Two gels with essential cation-oxygen-silicon ionic link were found as reaction products. The waters are meteoric in origin. From isotopic compositions, dissolved CO2 species are in part from oxidation of organic material and in part from the solution of calcite. The CO2 partial pressure range from an exceptionally low value of 0.0000053 atm. to an exceptionally high value of 0.87 atm. The CO2 partial pressures are dependent variables and do not control the chemical reactions. Analcime should not be regarded necessarily as a lower grade metamorphic facies indicator nor should prehnite necessarily be regarded as a higher grade metamorphic product. Rather, they may be products of different chemical rather than physical conditions. (Woodard-USGS)
W79-03340

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03341

PREDICTED WATER-LEVEL AND WATER-QUALITY EFFECTS OF ARTIFICIAL RECHARGE IN THE UPPER COACHELLA VALLEY, CALIFORNIA, USING A FINITE-ELEMENT DIGITAL MODEL,
Geological Survey, Menlo Park CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03346

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, FEBRUARY 1975 - SEPTEMBER 1977,
Geological Survey, San Antonio, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W79-03353

RELATIONSHIP TO EXTRACTABLE SOIL MANGANESE TO SOIL PROPERTIES,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-03360

POSSIBLE ERRORS CAUSED PRIOR TO MEASUREMENT OF MERCURY IN NATURAL WATERS WITH SPECIAL REFERENCE TO SEAWATER,
Hokkaido Univ., Hakodate (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-03368

MICROBIAL ASPECTS OF THE VOLATILE LOSS OF APPLIED MERCURY (II) FROM SOILS,
Oregon State Univ., Corvallis. Dept. of Soil Science; and Oregon State Univ., Corvallis. Dept. of Agriculture Chemistry.
E. R. Landa.
Journal of Environmental Quality, Vol. 7, No. 1, p. 84-86, January-March, 1978. 1 fig, 1 tab, 21 ref.

Descriptors: Autoclaves, *Mercury, *Volatility, *Microbial degradation, Soil amendments, *Montana.

Five surface soils from southeastern Montana were studied to determine the effects of autoclaving and glucose additions on the volatile loss of applied divalent inorganic mercury. Soils were amended to 1 ppm Hg as 203 Hg - Hg(NO3)2, maintained at room temperature near the 1/3-bar moisture content, and Hg content monitored for 7 weeks. Mercury losses from soils receiving neither autoclaving or glucose additions ranged from 5 to 30%. In general, autoclaving reduced the total quantity of Hg lost, while glucose additions increased the initial loss rate of applied Hg. (Skogerboe-Colorado State)
W79-03419

PHOSPHATE ADSORPTION-DESORPTION CHARACTERISTICS OF SOILS AND BOTTOM SEDIMENTS IN THE MAUMEE RIVER BASIN OF OHIO,
Texas A and M Univ., College Station, Dept. of Agronomy.
D. L. McCallister, and T. J. Logan.
Journal of Environmental Quality, Vol. 7, No. 1, p 87-92, January-March, 1978. 2 fig, 6 tab, 27 ref.

Descriptors: *Adsorption, Eutrophication, Pollutants, *Phosphates, Runoff, Isotherms, *Desorption, Soils, Bottom sediments, *Ohio, *Maumee River basin(Ohio).

Langmuir adsorption isotherms showed that Maumee River Basin sediments had adsorption capacities 10 to 20 times greater than Basin soils. Although the soil clay fractions had adsorption capacities higher than the whole soil, they were considerably less than those of the sediments and the difference is attributed to the higher content of amorphous or low-range order iron and aluminum components in the bottom sediments. Equilibrium phosphorus concentration (EPC) and phosphorus desorbed was similar for soil and sediments as well as total P, indicating that although the bottom sediments have a high capacity to adsorb P, this capacity has not been realized. Correlations between adsorption-desorption parameters and soil/sediment properties are presented. Bray Pl 'available' P was highly correlated with EPC and P desorbed in the soils but to a lesser extent in the bottom sediments. CDB and oxalate extractable-P was highly correlated with P adsorption capacity in the bottom sediments but not in the soils. (Skogerboe-Colorado State)
W79-03421

THE MECHANISM OF SULFATE ADSORPTION ON IRON OXIDES,

Griffth Univ., Nathan (Australia). School of Science.
R. L. Parfitt, and R. St. C. Smart.
Soil Science Society of America Journal, Vol. 42, No. 1, p 48-50, January-February, 1978. 5 fig, 2 tab, 17 ref.

Descriptors: *Sulfates, *Adsorption, *Iron oxides, Isotherms, Spectroscopy, Structural models, Soil chemistry.

Adsorption isotherms were determined for sulfate adsorption on iron oxides under acid conditions. The product of the surface reaction between the iron oxides and sulfate ions was examined by infrared spectroscopy which showed four bands in the Nu S-0 stretching region. Thus a structural model could be obtained for the reaction. Two surface hydroxyl groups (or OH2(+) ions) are replaced by one sulfate ion, and two oxygen atoms of the sulfate ion are coordinated each to a different Fe(3+) ion, resulting in the binuclear bridging surface complex Fe-0-S(02)-0-Fe. The complex is formed on the surfaces of goethite (alpha-FeOOH), akaganeite (beta-FeOOH), lepidocrocite (gamma-FeOOH), hematite (alpha-Fe203) and amorphous ferric hydroxide. (Skogerboe-Colorado State)
W79-03428

THE ACETYLENE INHIBITION METHOD FOR SHORT-TERM MEASUREMENT OF SOIL DENITRIFICATION AND ITS EVALUATION USING NITROGEN-13,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
M. S. Smith, M. K. Firestone, and J. M. Tiedje.
Soil Science Society of America Journal, Vol. 42, No. 4, p 611-615, July-August, 1978. 1 fig, 6 tab, 11 ref.

Descriptors: *Denitrification, Inhibitors, *Nitrogen-13, Reduction(Chemical), Anaerobic conditions, Aerobic treatment, Soil treatment.

Acetylene was found to effectively inhibit the reduction of N2O by anaerobic soils. With concentrations of C2H2 above 0.1 atm, added NO3(-) was quantitatively converted to N2O and added N2O was reduced at an insignificant rate. Experiments with 13N demonstrated that at low soil nitrate concentrations at least 0.1 atm C2H2 was required for effective inhibition. Denitrification rates determined by 13N and by C2H2 inhibition methods correlated well, as did determination of N2O/(N2 + N2O). The methods also revealed that an acceleration in denitrification rate occurred within a few hours after soil was exposed to anaerobic conditions. The acetylene method was generally used to measure denitrification rates in soils incubated as anaerobic slurries, but was also used to determine rates for field moist aggregates incubated anaerobically and aerobically. When assayed as anaerobic slurries, initial denitrification rates ranged from 0.1 to 0.7 m moles N gas/soil/min for the mineral soils examined. The denitrification rate in aerobic aggregrates was approximately 1,000 times less, showing the strong inhibitory effect of O2 on the indigenous denitrifying enzymes. (Skogerboe-Colorado State)
W79-03429

SYSTEM FOR ANALYSIS OF ORGANIC POLLUTANTS IN WATER,
La Trobe Univ., Bundoora (Australia). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 5A.
W79-03430

DETERMINING SOIL GYPSUM CONTENT AND EXPRESSING PROPERTIES OF GYPSIFEROUS SOILS,
National Soil Survey Lab., Lincoln, NE.
For primary bibliographic entry see Field 2G.
W79-03491

2L. Estuaries

EFFECTS OF MOSQUITO CONTROL DITCHING ON JUNCUS MARSHES AND UTILIZATION OF MOSQUITO CONTROL DITCHES BY ESTUARINE FISHES AND INVERTEBRATES,
North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.
For primary bibliographic entry see Field 5G.
W79-03023

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 6G.
W79-03043

HYDROLOGY OF SMALL OCEANIC ISLANDS - INFLUENCE OF ATMOSPHERIC PRESSURE ON THE WATER TABLE,
Washington State Univ., Pullman. Dept. of Geology.
H. L. Vacher.
Ground Water, Vol 16, No 6, p 417-423, November-December 1978. 8 fig, 12 ref.

Descriptors: *Islands, *Atmospheric pressure, *Water table, *Model studies, Hydrology, Recharge, Sea level, Ocean waves, Rainfall, Effects, *Oceanic islands, *Sea-level fluctuations, Permeable oceanic island, Ocean fronts, Astronomical tides, Inverted barometer effect, Pressure-related fluctuations.

There is a spectrum of sea level fluctuations that affects the water table of small, permeable islands. At the high-frequency end of the spectrum are the semi-diurnal and diurnal components of the astronomical tides. Also affecting sea level elevation are atmospheric pressure and the temperature and salinity (hence density) of the ocean column. Changes in atmospheric pressure cause sea level changes on the order of up to about 30 cm by what oceanographers call the 'inverted barometer effect'. As a result, pressure changes, like tides, generate waves that migrate across the water table. Amplitudes of the resultant pressure-related water table fluctuations diminish inland. However, owing to the relatively long period of the pressure-related fluctuations, their inland attenuation is far less than that of the hydraulically analogous tides. In fact, in Bermuda for example, the pressure-related water table fluctuations completely dominate water table statistics that reflect day-to-day changes in elevation. Because a drop in pressure and corresponding rise in the water table accompany passage of a storm front, which also bring a rainfall, there commonly is a coincidental, and very misleading, correlation between rainfalls and water table rises. In island and coastal settings, non-tidal sea level changes and their effect on the water table must be considered if recharge is to be evaluated correctly from water table data. (Roberts-ISWS)
W79-03056

WAVE DAMPENING DUE TO RUBBLE-MOUND BREAKWATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-03059

WAVE FORCES ON PIPELINE BURIED IN PERMEABLE SEABED,
New South Wales Univ., Kensington (Australia). Dept. of Theoretical and Applied Mechanics.
For primary bibliographic entry see Field 8B.
W79-03060

LABORATORY EXPERIMENTS WITH SOLITARY WAVE,
Technion - Israel Inst. of Tech., Haifa. Coastal and Marine Engineering Research Inst.
For primary bibliographic entry see Field 8B.
W79-03061

TEMPORAL VARIATIONS AND PROBABLE ORIGINS OF HYDROCARBONS IN THE WATER COLUMN OF BEDFORD BASIN, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
D. C. Gordon, P. D. Keizer, and J. Dale.
Estuarine and Coastal Marine Science, Vol 7, No 3, p 243-256, September 1978. 8 fig, 4 tab, 28 ref.

Descriptors: *Organic compounds, *Canada, *Marine biology, *Water properties, *Estuaries, Bays, Sea water, Phytoplankton, Primary production, Chlorophyll, Temporal distribution, Chemicals, Chemical analysis, Analytical techniques, *Pollutant identification, *Biosynthesis, *Bedford Basin(Nova Scotia).

Hydrocarbons in Bedford Basin seawater were analyzed on 33 dates between January 1975 and April 1976 by fluorescence spectroscopy and gas chromatography. Crude oil equivalent concentrations averaged 2.5 and 1.8 microgram/1 at 2 and 50 m, respectively, while total n-alkanes averaged 200 and 180 ng/l at the same depths. Crude oil equivalent concentrations were slightly higher than generally found in oceanic regions, while total n-alkane concentrations were comparable. Hydrocarbon concentrations tended to be highest in the winter and lowest in the summer. Biosynthesis does not appear to be an important source of hydrocarbons since the concentration of only one hydrocarbon (retention index of 2052 and suspected to be a polyunsaturated olefin reported to be common in marine phytoplankton) increased during the spring phytoplankton bloom. The majority of hydrocarbons appear to be of anthropogenic origin, and the increased use of fuel oils in the urban area surrounding Bedford Basin during the colder months can explain the higher winter-time concentrations. If biosynthesis is not an important hydrocarbon source in Bedford Basin, it can be argued that it is also unimportant in the ocean as a whole. (Sims-ISWS)
W79-03062

SHOREFACE-CONNECTED SAND RIDGES ON AMERICAN AND EUROPEAN SHELVES: A COMPARISON,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Lab.
D. J. P. Swift, G. Parker, N. W. Lanfredi, G. Peillo, and K. Figge.
Estuarine and Coastal Marine Science, Vol 7, No 3, p 257-273, September 1978. 14 fig, 33 ref.

Descriptors: *Sand waves, *Topography, *Continental shelf, *North America, *South America, *Europe, *Atlantic Ocean, Erosion, Sedimentation, Sediments, Coasts, Shores, Currents(Water), Ocean currents, Circulation, Water circulation, Oceanography, Shorefaces, Bedforms, Sand ridges.

Large-scale sand ridges, 10 m or more in height and 2-4 km apart, have long been accepted as characteristic of shelves experiencing strong tidal flow. However, they also occur on inner continental shelves whose strongest flows are wind-induced. The Middle Atlantic Bight of North America is the best known example, but inner shelf ridge topographies occur extensively on other Atlantic shelves. This paper discussed similarities and differences among the inner shelf ridges of North America, South America, and Europe as a necessary step prior to the framing and testing of hypotheses concerning the hydrodynamics of ridge formation. Inner shelf ridges characteristically are aligned obliquely to the shoreline, with acute angles opening into the prevailing flow direction. Downcurrent slopes tend to be steeper and finer grained. The ridges tend to migrate downcoast and offshore, extending their crestlines so as to maintain contact with the shoreface. Where ridges are nearly shore-parallel (current parallel), the movement is expressed as downcurrent growth of ridges and downcurrent extension of swales between

lges. Ridge behavior, and especially ridge migra-
n rates, are necessary information for marine
vironmental management, since ridges are most
tive in the nearshore zone where the shelf floor
used for sewage outfalls, deepwater ports, nucle-
reactor sites, and other structures requiring a
easure of sea floor stability. (Sims-ISWS)
79-03063

CTINIDE ACTIVITIES IN WATER ENTER-
G THE NORTHERN NORTH SEA,
eutsches Hydrographisches Inst., Hamburg (Ger-
any, F.R.). Lab. Sulldorf.
r primary bibliographic entry see Field 5A.
79-03067

EASUREMENT OF OCEAN WAVE HEIGHTS
SING THE GEOS 3 ALTIMETER,
ational Oceanic and Atmospheric Administra-
n, Boulder, CO. Wave Propagation Lab.
r primary bibliographic entry see Field 7B.
79-03076

CEANOGRAPHIC CONDITIONS IN LOWER
OOK INLET: SPRING AND SUMMER 1973,
ational Oceanic and Atmospheric Administra-
n, Seattle, WA. Pacific Marine Environmental
ab.
D. Muench, H. O. Mofjeld, and R. L. Charnell.
urnal of Geophysical Research, Vol 83, No C10,
5090-5098, October 20, 1978. 8 fig, 1 tab, 17 ref.

escriptors: *Estuaries, *Tidal waters, *On-site
ta collections, *Alaska, Currents(Water), Salin-
, Temperature, Water temperature, Density,
mpling, On-site investigations, Current meters,
ater sampling, Tidal effects, Circulation, Water
rculation, Oceanography, *Cook Inlet(AK).

urrent, salinity, and temperature data obtained
om lower Cook Inlet during May-September
73 have been analyzed. These data define a
gional mean circulation whose main features are:
) a concentrated southward flow along the west-
n shore of lower Cook Inlet of water from upper
ook Inlet which has been diluted by river input,
) an intense westerly flow across the lower inlet
hich originates from Kennedy Entrance, exits via
elikof Strait, and is bathymetrically steered in a
yclonic sense during its transit across the inlet,
d (3) a slow northward drift in eastern lower
ook Inlet. The southward flow is an estuarine
ode due to freshwater input to upper Cook Inlet.
he westerly flow is driven by the westward flow-
g Alaska Current. The weak northward drift
places water which has been entrained into the
uth flowing current. Large tidal and wind-in-
ced currents are superposed on this mean flow
d contribute to complex temperature and salinity
stributions. The circulation scheme as redefined
ere allows for vertical motions and has important
nsequences in relation to high regional biological
oductivity and fates of contaminants. (Sims-
SWS)
79-03077

IASS TRANSPORT IN A COASTAL CHAN-
EL, MARCO RIVER, FLORIDA,
osenstiel School of Marine and Atmospheric Sci-
nce, Miami, FL.
van de Kreeke.
stuarine and Coastal Marine Science, Vol 7, No
p 203-214, September 1978. 6 fig, 3 tab, 7 ref.
SF EGN76-08288.

escriptors: *Tidal waters, *Mass transfer, *Chan-
els, *Florida, On-site investigations, On-site data
ollections, Model studies, Mathematical models,
heoretical analysis, Wetlands, Coasts, Flow,
ides, Tidal effects, Salts, Salinity, Estuaries,
Coastal channels, *Marco River(FL).

t follows from measurements that advection is the
ominant mode of transport in the Marco River.
ypical values for the tidally averaged salt and
ater flux were respectively, 400 kg/s and 20 cu
n/s. An analysis of the dynamics of the flow
howed that the longitudinal flux of water is asso-
ciated with the tidal stress, the tidally averaged bottom stress, the spatial variation of the mean water level, and the cross-sectionally averaged salinity. An approximate analytic expression was derived to illustrate the independent effects of the differences in tidal amplitude, phase, mean water level, and density at the open boundaries on the net flux of water. Using a finite difference technique, the magnitude of the tidally averaged water flux and its components associated with the Eulerian mean velocity and Stokes Drift velocity were computed for two schematizations of the Marco River. Computed and measured quantities were in fair agreement. (Sims-ISWS)
W79-03078

A RECORD OF THE ACCUMULATION OF SEDIMENT AND TRACE METALS IN A CONNECTICUT, U.S.A., SALT MARSH,
Yale Univ., New Haven, CT.
For primary bibliographic entry see Field 5B.
W79-03113

NUMERICAL TECHNIQUES FOR ESTIMATING BEST-DISTRIBUTED MANNING'S ROUGHNESS COEFFICIENTS FOR OPEN ESTUARIAL RIVER SYSTEMS,
Rutgers - The State Univ., Piscataway, NJ. Dept. of Chemical and Biochemical Engineering.
B. Davidson, R. Vichnevetsky, and H. T. Wang.
Water Resources Research, Vol. 14, No. 5, October 1978, p 777-789. 10 figs, 1 tab, 65 refs. A-45-NJ. (3) 14-34-0001-7064.

Descriptors: Estuaries, Friction, *Manning's equation, Roughness, Estimation, Reynolds number, Hydraulic models, *Delaware River estuary, Model studies, Simulation analysis.

A finite difference version of the Levenberg-Marquardt method for nonlinear least squares prolems has been extended to include inverse problems in distributed estuarial hydraulic systems. The objective in solving the inverse problems was to establish a numerical simulation procedure for estimating best-distributed Manning's roughness coefficients from sets of observed tide heights. As an illustration, spatially varying Manning's roughness coefficients for the Upper Delaware River Estuary system were determined for several representative sets of tide height data for the period October 1973 to June 1974. The roughness coefficients were modeled as polynomial functions of distance. Manning's n was thus found generally to vary inversely with distance from the head of tide at Trenton to Wilmington. The spatially distributed tidal-averaged Reynolds number Re was used to correlate Manning's n and Darcy-Weisbach's f. The resultant n-Re relationships displayed three distinct hydrodynamic flow regimes characterized as having turbulence. Both n and f were found to be independent of Re for Re $<$ 1.52 x 106 but inversely related to Re for Re$>$ 1.2 xx 106. Among the numerical techniques used to simulate tidal hydraulic transients it was found that a 'hopscotch' finite difference method yielded the best compromise between computational economy and overall accuracy.
W79-03115

FACTORS REGULATING THE DISTRIBUTION AND POPULATION DYNAMICS OF THE AMPHIPOD GAMMARUS PALUSTRIS IN AN INTERTIDAL SALT MARSH COMMUNITY,
Maryland Univ., College Park. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W79-03116

ON NUTRIENTS AND THEIR ROLE AS PRODUCTION LIMITING FACTORS IN THE BALTIC,
Fishery Board of Sweden, Goteborg. Inst. of Marine Research.
For primary bibliographic entry see Field 5C.
W79-03182

BOUYANT SURFACE JET IN TIDAL LONGSHORE CURRENT,
New South Wales Univ., Kensington (Australia). School of Mathematics.
For primary bibliographic entry see Field 8B.
W79-03288

ON THE NUMERICAL MODELLING OF SHORT WAVES IN SHALLOW WATER,
International Inst. for Hydraulic and Environmental Engineering, Delft (The Netherlands).
For primary bibliographic entry see Field 8B.
W79-03292

ENERGY FLUX AND WAVE ACTION IN GRAVITY WAVES PROPAGATING ON A CURRENT,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W79-03294

THE DAMPING OF SOLITARY WAVES,
Coastal and Marine Engineering Research Inst. Haifa (Israel).
For primary bibliographic entry see Field 8B.
W79-03295

LITTORAL DRIFT AND EROSION AT BELLE PASS, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
E. J. Dantin, C. A. Whitehurst, and W. T. Durbin.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW4, Proceedings Paper 14184, p 375-390, November 1978. 17 fig, 2 tab, 15 ref.

Descriptors: *Louisiana, *Beach erosion, *Beaches, *Model studies, Coastal engineering, Hydraulic models, Littoral drift, Sediment transport, Shore protection, *Jetties, Tidal flow.

Channel enlargement and modifications to the jetties at Belle Pass, the mouth of Bayou Lafourche on the Gulf coast of Louisiana, had become necessary due to increased marine traffic by offshore oil and mining production and the fishing industry, along with the proposed development of nearby Port Fourchon. Permission for construction, required by the Corps of Engineers, was granted after map and aerial photo studies, field observations, and hydraulic model experiments showed that beach erosion, and expecially littoral bypassing, would be affected insignificantly by extension to the existing single jetty and construction of a new twin jetty. The average annual recession rate of the coastline in the Belle Pass area between 1885 and 1932 was 79 ft/yr (24m/yr). After construction of the first jetties in 1940, this rate gradually decreased to 25 ft/yr (8 m/yr) by 1974. Most littoral material bypasses the jetties due to inefficient orientation to the present shore line. Field tracking of subsurface floats provided data to calibrate a small, distorted-scale model. (Lee-ISWS)
W79-03299

POSITIVE FLOW ESTUARY STRUCTURE,
Poseidon Marketing and Development Co., Arcadia, CA. (Assignee).
For primary bibliographic entry see Field 8B.
W79-03318

GROUND-WATER RESOURCES OF THE CAPE LOOKOUT NATIONAL SEASHORE, NORTH CARLOINA,
Geological Survey, Raleigh, NC. Water Resources Div.
M. D. Winner, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 499. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-52, June 1978. 49 p, 26 fig, 2 tab, 6 ref.

Descriptors: *Groundwater resources, Hydrology, *Aquifer characteristics, *Saline water intrusion, *National seashores, *North Carolina, Water quality, Water yield, Saline water-freshwater interfaces, *Cape Lookout National Seashore(NC).

Fresh groundwater in the Cape Lookout National Seashore in North Carolina occurs in the unconfined aquifer, an upper confined aquifer, and a lower limestome aquifer. The unconfined aquifer beneath dunes on the barrier islands is estimated to yield as much as 30 gallons per minute of freshwater to a horizontal well, but this aquifer is subject to periodic overwash by the ocean, thus temporarily contaminating the aquifer with saltwater. The upper confined aquifer is about 90 to 150 feet deep, but is known to contain freshwater only in the Drum Inlet area. The potential yield of this aquifer where it is fresh is unknown because of the possibility of saltwater encroachment. The lower limestone aquifer (150 to 550 feet deep) contains freshwater southeast of Drum Inlet; potential yields is estimated to be as great as 500 gallons per minute per well. The estimated yields from all aquifers depend on the position of the saltwater interface at any given site. Maps of the Seashore show areas where freshwater may occur in the unconfined aquifer; each map is accompanied by a description of the availability of freshwater. (Woodard-USGS)
W79-03337

ENVIRONMENTAL ASPECTS OF A WELL BLOWOUT IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-03362

APPLICATION OF THE ROTATED DISK ELECTRODE TO MEASUREMENT OF COPPER COMPLEX DISSOCIATION RATE CONSTANTS IN MARINE COASTAL SAMPLES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W79-03365

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W79-03366

POSSIBLE ERRORS CAUSED PRIOR TO MEASUREMENT OF MERCURY IN NATURAL WATERS WITH SPECIAL REFERENCE TO SEAWATER,
Hokkaido Univ., Hakodate (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-03368

DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) IN ESTUARINE ECOSYSTEMS. TESTING THE CONCEPT OF EQUILIBRIUM PARTITIONING IN THE MARINE ENVIRONMENT,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5B.
W79-03369

MEASUREMENT OF CU AND ZN IN SAN DIEGO BAY BY AUTOMATED ANODIC STRIPPING VOLTAMMETRY,
Naval Ocean Systems Center, San Diego, CA.
For primary bibliographic entry see Field 5A.
W79-03370

LIGHT HYDROCARBONS IN RECENT TEXAS CONTINENTAL SHELF AND SLOPE SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-03371

SYSTEMS ASPECT OF OCEAN THERMAL ENERGY CONVERSION,
TRW Systems and Energy, Redondo Beach, CA.
For primary bibliographic entry see Field 8C.
W79-03375

AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS,
Engineering-Science, Inc./Texas, Austin.
For primary bibliographic entry see Field 5B.
W79-03377

FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY. RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W79-03378

THE KINEMATICS OF BREAKING WAVES IN THE SURF ZONE,
Naval Postgraduate School, Monterey, CA.
A. J. Olsen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 723, Price codes: A05 in paper copy, A01 in microfiche. Naval Postgraduate School Master's Thesis, September 1977. 68 p, 13 fig, 3 tab, 5 append.

Descriptors: *Rip currents, *Surf, *Waves, Environmental effects, Beaches, *Outer Continental Shelf, *Nearshore processes, Onshore effects, Kinematics.

Simultaneous measurements of sea surface elevation and onshore and alongshore water particle velocities were measured at three locations within the surf zone using two capacitance type penetrating wave staffs and three tow-component electromagnetic flow meters. The probability density functions, pdf, for the sea surface elevation were always highly positively skewed, whereas the pdf's for the velocities were both negatively and positively skewed. Mean values of the onshore and alongshore components of flow reflected the influence of a rip current frequently observed just south of the instrument location. Strong harmonics in the spectra of sea surface fluctuations and particle velocities infer nonlinear conditions. Coherence values between waves and onshore flow were high, ranging above 0.9. The coherence between waves and onshore flow was used to separate the turbulence and wave-induced velocity components. Over the range of collapsing to spilling breakers a reasonable value for the ratio of turbulent to wave-induced velocity was determined to be approximately 0.75. Saturation regions were found in the wave and velocity energy-density spectra at higher frequencies as evidenced by -5 and -3 slopes, respectively. (Sinha-OEIS)
W79-03379

THE NORTH CAROLINA COASTAL ZONE AND ITS ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES, AND OFFSHORE WATERS, VOLUME I,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 10C.
W79-03380

THE NORTH CAROLINA COASTAL ZONE AND ITS ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES, AND OFFSHORE WATERS. VOLUME II,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 1
W79-03381

NEARSHORE DISPOSAL: ONSHORE SE MENT TRANSPORT,
Coastal Engineering Research Center, Fort E voir, VA.
For primary bibliographic entry see Field 5B.
W79-03382

A STUDY OF NITRIFICATION IN THE DEL WARE RIVER ESTUARY,
Rutgers - The State Univ., New Brunswick, Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-03439

COEXISTENCE OF TOXIC AND NONTOX DINOFLAGELLATES RESEMBLING GO YAULAX TAMARENSIS IN NEW ENGLA COASTAL WATERS (NW ATLANTIC),
Bigelow Lab. for Ocean Sciences, West Boothb Harbor, ME.
For primary bibliographic entry see Field 5C.
W79-03444

TOXICITY IN RESTING CYSTS OF THE RE TIDE DINOFLAGELLATE GONYAULAX E CAVATA FROM DEEPER WATER COAST SEDIMENTS,
Oslo Univ. (Norway). Dept. of Marine Biolo and Limnology.
For primary bibliographic entry see Field 5C.
W79-03447

SEEVOGEL ALS INDIKATOREN FUR ZE LICH UND ORTLICH BEGRENZTE MEERE VERSCHMUTZUNG IM GEBIET VON HE GOLAND (DEUTSCHE BUCHT) (SEA BIRI AS INDICATORS OF ACCIDENTAL MARIN POLLUTION IN THE HELGOLAND ARE GERMAN BIGHT),
Institute fuer Vogelforschung, Helgoland (Ge many, F.R.) Inselstation.
For primary bibliographic entry see Field 5C.
W79-03457

THE OXIDATION OF PETROLEUM HYDR CARBONS BY MARINE BACTERIA,
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 5C.
W79-03480

SOME ASPECTS OF THE BIOLOGY AN HEAVY METAL ACCUMULATION OF TH FISH LIPARIS LIPARIS IN THE SEVERN E TUARY,
Bath Univ. (England). School of Biological Sc ences.
For primary bibliographic entry see Field 5C.
W79-03497

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HYDRODYNAMICS OF HOLLOW FIBER RE VERSE OSMOSIS MODULES,
Monsanto Research Corp., Dayton, OH.
J. J. Hermans.
Membrane Digest, Vol 1, No 3, p 45-62, Fall, 197 3 fig. 14-30-2773.

Descriptors: *Hydrodynamics, *Flow measurement, *Flow profiles, Desalination, Mathematic Equations, Theoretical analysis, Membrane proc esses, Reverse osmosis, Desalination apparatu Membranes, Flow characteristics

e theoretical relationships describing hollow
er desalination units are developed in two parts:
al flow and radial flow. The assumptions re-
red in developing the differential equations for
h flow regime are examined, and mathematical
ails for both axial flow and radial flow are
sented. (Davison-IPA)
79-03024

OLARIZATION AT MEMBRANE-SOLUTION TERFACES IN REVERSE OSMOSIS (HY-RFILTRATION)
lifornia Univ., Berkeley. Coll. of Engineering.
P. Minning, and K. S. Spiegler.
Charged Gels and Membranes I, p 277-298, 76. Eric Selegny (ed.), D. Reidel Publication Co. ordrecht-Holland. (California Water Resources nter Desalination Project). S-175.

escriptors: *Reverse osmosis, *Electrodialysis, esalination processes, *Hyperfiltration, Mem-ne processes, *Polarization.

e study of electrical potential differences be-een electrolyte solutions separated by desalina-n membranes has led to the conclusion that not ly ion-exchange membranes used in electrodialy- but also modified cellulose acetate membranes, ed in reverse osmosis, often contain fixed arges. Systematic variation of the concentra-ns, flow rates, and pressures of sodium chloride utions flowing past the inner surface of a cylin-cal modified cellulose acetate membrane (cured 94 degrees C, nominal diameter 1 inch = 2.54) led to estimates of the interfacial salt concen-tion buildup and showed that streaming poten-ls of 6.2 to 8.0 mV/100 psi (0.91-1.17 mV atm-1) re obtained for 0.5 M (29225 ppm) and 0.1 M 345 ppm) sodium chloride solutions respectively. e polarity indicated a fixed negative charge. nyder-Calif Davis)
79-03129

UMA DESALTING TEST FACILITY,
reau of Reclamation, Boulder City, NV. Lower olorado Region.
M. Trompeter.
rizona Professional Engineer, Vol. 30, No. 7, p. 5, July, 1978. 3 fig.

escriptors: *Desalination plants, *Water treat-ent, *Saline water, *Testing procedures, Mexican ater treaty, Colorado River, Reverse osmosis, ectrodialysis, Drainage water, Salinity, Project ost-evaluation, Water use, Desalination appara-s.

nce the signing of the U.S.-Mexican water trea-s (1944-1973), guaranteeing Mexico 1.5 MAF of olorado River water annually and maintaining nimum salinity levels, U.S. researchers have en developing desalination techniques to make mpliance with these agreements possible. A 60-re desalting test facility has been constructed ur miles west of Yuma, Arizona, with the intent reclaiming drainage water from the Welltton-ohawk irrigation district. Three major objectives the project have been identified: (1) providing ta on desalting models and equipment operated pretreated water from the main conveyance annel, (2) allowing desalting manufacturers to in experience with their equipment, and (3) pro-ding criteria for the evaluation of desalting uipment proposed for the Yuma desalting plant. ght reverse osmosis units and four electrodialysis its have been installed and operated in this facili-to achieve these objectives. Between November 74 and May 1978, these desalting units accumu-ted over 200,000 hours of operating time, and ve been successful in accomplishing most of the jectives of the Colorado River Basin Salinity ontrol Project and provided invaluable design ta relating to specific site problems. (Tickes-rizona)
779-03139

REEZE DESALINATION AND CONCENTRA-ION APPARATUS,
. F. Smirnov, V. M. Parkhitko, and V. I. Zverkhovsky.
U.S. Patent No. 4,112, 702, 11 p, 2 fig, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 629, September 12, 1978.

Descriptors: *Patents, *Desalination, *Water treatment, *Water purification, Sea water, *Freezing, Desalination processes, Crystallization, Equipment, Heat exchangers, Food processing industry, *Freeze desalination.

The freeze desalination and concentration apparatus may be used for desalination of sea and saline water, for producing high-grade potable distilled water with an output of up to 24 cu.m of distilled water per day on sea going vessels and other vehicles, as well as for water supply systems of small settlements in remote places. It may also be used in the food industry for concentration of various liquid food products. Desalination or concentration of solutions by freezing comprises three basic steps: formation of ice from solution; separation and washing of ice from brine; and ice melting. The desalination unit includes in flow sequence, a three-circuit heat exchanger, a condenser for a refrigerant and for melting the ice mass, and a cylindrical crystallizer having a separator with an auger arrangement mounted inside the crystallizer. An ice-cutting device is accommodated between the crystallizer and separator, and another ice-cutting device is provided between the casing of the desalination unit and the outer ice-forming surface of the crystallizer. (Sinha - OEIS)
W79-03312

APPARATUS FOR DESALINATING WATER BY REVERSE OSMOSIS,
Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht-Terperhude (Germany, F.R.) (Assignee).
K. W. Boddeker, and W. Hilgendorff.
U.S. Patent No. 4,115,274, 7 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 974, No. 3, p. 1490-1491, September 19, 1978.

Descriptors: *Patents, *Desalination, *Water treatment, Saline water, *Reverse osmosis, Membrane processes, *Desalination apparatus.

An apparatus for desalinating seawater by reverse osmosis has a series of porous discs each covered on both sides by a membrane, and compressed at their edges between respective pairs of a stack of module plates which are identical. Each module plates consist of two mirror image halves, alternate module plates in the stack being rotated through 180 degrees. A zig-zag flow path through the stack is thereby provided with desalinated water passing by reverse osmosis into the porous discs and hence radially outward of the stack for collection. (Sinha - OEIS)
W79-03326

3B. Water Yield Improvement

WATER HARVESTING FOR AFFORESTATION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,
Research Inst. of Forests and Rangelands, Tehran (Iran).
P. Mehdizadeh, A. Kowsar, E. Vaziri, and L. Boersma.
Soil Science Society of America, Journal, Vol. 42, No. 4, p. 644-649, July-August, 1978. 5 fig, 2 tab, 21 ref.

Descriptors: *Water harvesting, *Asphalt, *Membranes, *Reforestation, *Water spreading, Rainfall-runoff relationships, Soil sealants, Surface runoff, Storm runoff, Water conservation, Water yield improvement, Slopes, Permeability, *Iran.

In Tehran and other large cities in arid regions, officials are interested in fighting atmospheric pollution by establishing city parks and greenbelts. Because insufficient water supplies are available to achieve this task, researchers have been investigating the possibility of collecting rainwater from impervious asphalt-line microwatersheds, both to save water for domestic consumption and to decrease the probability of mass mortality of trees during drought. The technique was investigated on asphalt-lined runoff plots 2 meters wide and 10 meters long, and on 2 meter-wide terraces along contour lines at 5 meter intervals on a 30 percent sloped hillside. Results indicated a runoff efficiency of nearly 75 percent initially on the microwatersheds and high soil water content on the terraces of -.4, -7.7, and -2.5 bars. After four years, however, the asphalt membrane began to deteriorate because of the freezing and thawing of the soil, growth of plants, and shrinking and swelling of clays, resulting in a drop to 25 percent efficiency. Further work, nevertheless, is being carried on to develop this technique as an alternative to conventional irrigation systems for the establishment of greenbelts in arid regions. (Tickes-Arizona)
W79-03133

THE PUBLIC DECIDES ABOUT WEATHER MODIFICATION,
Colorado Univ., Boulder. Human Ecology Research Services.
B. C. Farhar.
Environment and Behavior, Vol. 9, No. 3, p 279-310, September 1977, 9 tab, 33 ref.

Descriptors: *Attitudes, *Decision-making, *Social values, *Social impact, *Artificial precipitation, *Cloud seeding, *Weather modification, *Social research, Agrodimatology, Direct benefits, Indirect benefits, South Dakota Weather Modification Program(SDWMP), National Hail Research Experiment, Rainfall augmentation.

Drawing from several studies, this article examines public attitudes and values toward weather modification programs in general, and cloud seeding in particular. The research, conducted on the social aspects of weather modification, involved two types of major efforts -- the first involved surveys in 6 states focusing on citizen attitudes, opinion, knowledge, and beliefs about cloud seeding, and the second involved monitoring of large project areas in 24 states over a 6-year period between 1969 and 1975. Survey data indicate favorable attitudes toward the concept of weather modification and the effectiveness of cloud seeding, a low level of knowledge about weather modification, and a preference for decision-making and funding of weather modification programs to rest at the state or local level. Although most respondents feel they know little about weather modification programs, they tend to support these programs and to favor enabling legislation. Respondenst do not appear to be too concerned about risk. Most respondents in agricultural area do not exhibit antiscientific or antitechnological bias. They tend to favor modification programs when they preceive direct or indirect economics benefits. Where economic harm might result for some groups while benefiting others, the probability of opposition to a program is increased; where a project has local sponsorship and local support over several years, even a large scale negative weather event (e.g., flash flooding) in the presence of cloud seeding may not produce organized opposition. Organized opposition has resulted in areas where seeding has been blamed for drought conditions. The author presents a number of unresolved questions with regard to weather modification and discusses decision roles. (Arnold-NC)
W79-03155

A REANALYSIS OF THE SKAGIT CLOUD SEEDING PROJECT,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs, and A. L. Rangno.
Journal of Applied Meteorology, Vol. 17, No. 11, p 1661-1666, November 1978. 9 fig, 1 tab, 2 ref.

Descriptors: *Weather modification, *Cloud seeding, *Analytical techniques, *Washington, Regression analysis, Statistics, Runoff, Rainfall, Precipitation(Atmospheric), Silver iodide, Rivers, Data processing, Meteorology, Projects, *Skagit River(WA), *Skagit Cloud Seeding Project.

In a previous analysis by Hastay and Gladwell (1969) of the Skagit Cloud Seeding Project, the actual runoffs of the Skagit River during the two seeded years were compared to the runoffs predicted by a principal component (or covariate) analysis technique. It was concluded that seeding from ground generators with silver iodide increased the annual runoff of the Skagit River by at least 15% in the second year of the Skagit Project (the 1964 water year), and that this result was significant at the 0.005 (or higher) level. In this paper it was shown that this conclusion cannot be substantiated due to the inclusion in the analysis of a control river which behaved anomalously during the 1964 water year and on which the statistical significance of Hastay and Gladwell's result rests. Comparisons of the runoff of the Skagit river during the 1964 water year with the runoffs of two similarly situated rivers, with which the Skagit is well correlated historically, showed no significant effects due to seeding. (Sims-ISWS)
W79-03275

THE IMPENDING WATER FAMINE,
United Nations Educational, Scientific and Cultural Organization, Moscow (USSR). International Hydrological Programme.
For primary bibliographic entry see Field 6B.
W79-03435

3C. Use Of Water Of Impaired Quality

ECOLOGY AND ENVIRONMENT IN THE UNITED ARAB EMIRATES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
For primary bibliographic entry see Field 4C.
W79-03137

POTENTIAL USE OF FINELY DISINTEGRATED IRON PYRITE IN SODIC AND IRON-DEFICIENT SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-03423

THE SANDS OF WRATH: AMERICA'S DUST BOWL IN RETROSPECT,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 4C.
W79-03434

SALT OUTFLOWS FROM NEW AND OLD IRRIGATION LANDS,
Snake River Conservation Research Center, Kimberly, ID.
D. L. Carter, and C. W. Robbins.
Soil Science Society of America Journal, Vol. 42, No. 4, p 627-632, July-August, 1978. 3 fig, 3 tab, 13 ref.

Descriptors: *Sainity, *Leaching, Leachate, Drainage water, Water quality, *Salt balance, *Irrigated land, *Salts.

Three water application treatments with low salt water were applied to previously nonirrigated soil and to a similar soil which had been irrigated for 67 years. The total soluble salt content of these soils initially, and after one and two seasons of treatment, was measured to determine salt outflow. Residual soluble salts were essentially removed from the previously nonirrigated soil after 30 cm of water/m depth of soil had passed from the soil as leachate, regardless of the number of seasons required for that amount of leaching. The total quantity of residual salt removed from soil 5 m deep was 70 metric tons/ha, with about 38 metric tons/ha being leached out by the first 14 cm of leachate. After the residual salt was removed, the salt content of the newly irrigated soil was the same as that of the soil which had been irrigated for 67 years. Subsequent salt outflow from the soil was directly related to the quantity of water leaching through the soil, indicating that more minerals dissolved with more leaching. Soils irrigated for many years and then not irrigated for up to 10 years had no measurable reaccumulation of soluble salts during the period of nonirrigatin. (Skogerboe-Colorado State)
W79-03442

3D. Conservation In Domestic and Municipal Use

EVALUATION OF ALTERNATIVE STORM-WATER MANAGEMENT POLICIES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W79-03039

MUNICIPAL WATER CONSERVATION ALTERNATIVES,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sharpe.
Water Resources Bulletin, Vol. 14, No. 5, p 1080-1087, October 1978. 2 tab, 21 ref.

Descriptors: *Municipal water, *Water conservation, *Water policy, *Alternatives, Constraints, Pricing, Metering, Education, Programs, National goals.

The municipal water conservation options available to meet the goals of a national water conservation policy are evaluated. Water conservation with water conservation devices offers many significant advantages over education and pricing and metering as methods of accomplishing water conservation goals. Current constraints on the use of water conservation devices are outlined, and their elimination is suggested if the nation's water conservation goals are to be met. (Bell-Cornell)
W79-03092

PLANNING IN SMALL- AND MEDIUM-SIZE ILLINOIS MUNICIPAL WATER SYSTEMS,
Illinois Univ. at Urbana-Champaign.
J. C. van Es, and Richard J. Quigley.
Illinois Agricultural Economics, p. 17-23, January 1976, 7 tab, 12 ref.

Descriptors: *Municipal water, *Illinois, *Cities, *Planning, *Potable water, *Financial information.

This research deals with the planning and financial information aspects of small- and medium size water systems in Illinois; also, the social and organizational factors related to the provision of such a local service. The data are from a sample of 228 Illinois municipal water systems. Attempts to determine the relationships between planning and financial knowledge and municipal and water-system characteristics indicate a general weakness or absence of such relationships, although the relationships were consistently stronger for the municipal characteristics. The historical absence of the necessity to manage the water system other than in a routine fashion may have left these systems unprepared to meet future challenges.
W79-03097

OPTIMAL PLANNING FOR URBAN STORM DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03107

PLANNING STORM-DRAINAGE SYSTEMS FOR URBAN GROWTH,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03108

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03109

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D
W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D
W79-03122

A NEW APPROACH TO URBAN WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Hydrosystem Lab.
For primary bibliographic entry see Field 6A.
W79-03124

WATER HARVESTING FOR AFFORESTATION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,
Research Inst. of Forests and Rangelands, Tehran (Iran).
For primary bibliographic entry see Field 3B.
W79-03133

PRELIMINARY LISTING OF MUNICIPAL WATER SUPPLY CAPACITIES,
Oklahoma Foundation for Research and Development Utilization, Inc., Edmond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 495 Price Codes: A11 in paper copy, A01 in microfiche. Economic Development Research Report No. EDA-OER-76-037, September 1976. 231 p, tab. 99-7-13297, OER-489-G-76-16.

Descriptors: *Water supply, *Cities, *Municipal, *Storage capacity, *Data collections, Facilities, Water use, Human population, Rates, Water requirements, Consumption use.

A current listing of available data on U.S. water supply facilities in communities with a serviced population of over 2,000 is provided. The tabulated data are presented alphabetically by state and alphabetically by community name within the individual states. Statistics are given for: population served, water supply capacity in million gallons/day, average daily use in million gallons, per capital use rate, percent utilization of water supply capacity, and the potential population growth which would not impact on the existing system. (Davison-IPA).
W79-03261

NOMOGRAPHS FOR TEN-MINUTE UNIT HYDROGRAPHS FOR SMALL URBAN WATERSHEDS,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
For primary bibliographic entry see Field 6B.
W79-03272

URBAN RUNOFF CONTROL PLANNING,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
For primary bibliographic entry see Field 6B.
W79-03273

BIBLIOGRAPHY OF THE GEOLOGY AND HYDROLOGY OF THE ALBUQUERQUE GREATER URBAN AREA, BERNALILLO AND

PARTS OF SANDOVAL, SANTA FE, SOCORRO, TORRANCE, AND VALENCIA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 10C.
W79-03339

3E. Conservation In Industry

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN RUBBER PROCESSING OPERATIONS,
Research Triangle Inst., Research Triangle Park, NC. Center for Technology Applications.
For primary bibliographic entry see Field 5B.
W79-03008

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION, FORMULATION OF ALDRIN/DIELDRIN, DDT, ENDRIN, TOXAPHENE,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W79-03015

CONSERVATION OF PETROLEUM WASTES AT RED RIVER ARMY DEPOT,
Red River Army Depot, Texarkana TX. Dept. of Maintenance Effective Engineering.
For primary bibliographic entry see Field 5E.
W79-03018

PROCEEDINGS OF THE FIFTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Pacific Northwest Environmental Research Lab., Corvallis, OR. Industrial Wastes Branch.
For primary bibliographic entry see Field 5D.
W79-03031

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W79-03057

COMMERCIAL SAILING VESSELS - AN ECONOMIC ASSESSMENT,
For primary bibliographic entry see Field 6B.
W79-03192

EXTRACTION, PRODUCTION AND INVESTMENTS IN CAPITAL AND LEARNING, THE NATURAL RESOURCES INDUSTRIES,
Tel Aviv Univ. (Israel). Foerder Inst. for Economic Research.
For primary bibliographic entry see Field 6B.
W79-03194

WASTE CLEARINGHOUSE AND EXCHANGES: NEW WAYS FOR IDENTIFYING AND TRANSFERRING REUSABLE INDUSTRIAL PROCESS WASTES,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5D.
W79-03254

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,
B E and K, Inc., Birmingham, AL.
G. Rowlandson, and C. F. Cornell.
Appita, Vol. 32, No. 1, p 45-50, July, 1978. 8 fig, 16 ref.

Descriptors: *Kraft mills, *closed systems, *Water conservation, Water pollution sources, Water pollution control, Canada, Foreign countries, Economics, Water reuse, Recycling, Cooling water, Design, Water balance, Salts, Heat balance, Fiber recovery, Chemical recovery, Pulp and paper industry.

The closed-cycle pulp mill eliminates water pollution through internal recycling techniques, the only discharge being clean cooling water. The system also reclaims heat, fiber, and chemicals previously lost in the pulp mill effluent. Important facets of the closed-cycle pulp mill are outlined, and descriptions are given of the closed-cycle mill design (including water balance), closed-cycle counter-current bleach plant, and salt recovery system. The economics of the closed-cycle system are compared to those of external effluent treatment schemes with specific reference to the closed-cycle kraft pulp mill of Great Lakes Paper Co. at Thunder Bay, Ontario. (Swichtenberg-IPC)
W79-03385

NEW SYSTEM IMPROVES STEAM ENERGY USAGE AT TENNESSEE BOX PLANT.
Boxboard Containers, Vol. 86, No. 1, p 45, August, 1978.

Descriptors: *Box plants, *Steam, *Condensates, *Water reuse, *Closed systems, Tennessee, Water pollution sources, Water pollution control, Water temperature, Water pressure, Industrial water, Operation and maintenance, Boilers, Recirculated water, Corrugating machines, Water conservation.

Union Camp Corp. of Morristown, Tennessee, installed a high-pressure steam condensate return system on its corrugator in 1974. It drains the corrugator of condensate and returns it directly to the boiler with a minimum drop in temperature and pressure. A trapless return system was installed in 1977, considerably reducing steam energy consumption and maintenance. In this closed system, automatic maintenance of the pressure differential keeps the system in balance. Condensate is returned to the boiler with little drop in temperature, thereby requiring less energy for corrugator operation. (Louden-IPC)
W79-03387

WATER CONSERVATION AT ELY (PAPER) MILL,
Ely Paper Mills (England).
R. G. Reid.
In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve MillProfitability, March, 1978, London, England, Paper No. 15, 6 p.

Descriptors: *Water conservation, *Pulp and paper industry, Foreign countries, Europe, Water pollution control, Water pollution sources, Turbines, Generators, Electric powerplants, Water treatment, Industrial water, Boiler feed water, Treatment facilities, Water supply, Water costs, England, Ely River(England).

The Ely Paper Mill (Cardiff, South Wales) of Wiggins Teape Ltd. (United Kingdom) is situated along the River Ely. The closing of an iron mine, pumping about 4,000,000 gallons of water per day into the river and the simultaneous substantial increase in the company's license to abstract water from the river prompted Ely Paper Mill to install a 2.3 megawatt back-pressure turbine generator and to modernize the (river) water treatment plant. The treated river water is used as boiler feedwater and for the manufacture of vegetable parchment paper. Even with the drought of 1976 the mill managed to keep production at previous levels with one-half the consumption of water. (Swichtenberg-IPC)
W79-03389

HOW TWO BOARD MILLS HAVE CLOSED THEIR WATER SYSTEMS,
T.P.T. Ltd. (England). Board Div.
P. H. Trevanion.
In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper No. 16, 18 p, 7 fig.

Descriptors: *Water reuse, *Pulp and paper industry, *England, *Board mills, Water conservation, Foreign countries, Europe, Water pollution control, Water pollution sources, Recycling slime, Odor, Corrosion, Water temperature, Closed systems, Industrial water.

Reuse of clarified water has reduced effluent discharge from 20,000 to 1,800 gal/hr and from 35,000 to 7,000 gal/hr at the Oakwood and Stainland Mills of T.P.T. Ltd.'s Board Division (United Kingdom), respectively. Flow charts are presented of the water reuse systems at both board mills which operate a total of 3 multivat board machines to produce primarily chipboard and tube board. Slime, odor, corrosion, and high temperature problems have been minor at the Oakwood mill. (Swichtenberg-IPC)
W79-03390

ONE MILL'S APPROACH TO EFFLUENT TREATMENT,
Bowater Scott Corp. Ltd., Northfleet (England).
For primary bibliographic entry see Field 5D.
W79-03391

HOW SOME NORWEGIAN PAPER MILLS HAVE REDUCED THEIR FIBRE LOSSES,
Norwegian Pulp and Paper Research Inst., Oslo.
J. A. Oksum.
In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper 18, 13 p. 5 fig, 2 ref, 1 tab.

Descriptors: *Water conservation, *Fiber recovery, *Pulp and paper industry, *Norway, Foreign countries, Europe, Water reuse, Recycling, Water pollution control, Water pollution sources, Pulp wastes, White water(Paper machines), Pulp rejects, Industrial water.

A review is presented of the fiber recovery and water conservation programs which were implemented in Norwegian glassine, creped, kraft, printing, and writing paper mills under the direction of the Norwegian Pulp and Paper Research Institute. These schemes include use of filtered and uncleaned white water, recovery of centricleaner pulp rejects, and fiber recovery using wet-broke and lamella thickeners. (Swichtenberg-IPC)
W79-03392

WATER SAVING CHECK LIST PREPARED FOR UK (UNITED KINGDOM) PAPER AND BOARD MILLS.
Paper (London), Vol. 186, No. 5, p 276, September 6, 1976.

Descriptors: *Pulp and paper industry, *England, *Water consumption(Except consumptive use), Water conservation, Foreign countries, Europe, Water pollution control, Water pollution sources, Industrial water.

A 25-item checklist is given which has been prepared by the British Paper and Board Industry Federation (BPBIF) for aiding member-corporation mills in reducing their water consumption. Statistics gathered by BPBIF indicate that specific water utilization (gal/ton of product) has been cut by 33% between 1968 and 1974. (Brown-IPC)
W79-03402

FLOAT-WASH SYSTEM. CLOSING OF THE WATER CIRCULATION SYSTEM IN THE PULP AND PAPER INDUSTRY (FLOAT-WASH SYSTEM. SCHLIESSEN DES WASSERKREISLAUFES IN DER ZELLSTOFF- UND PAPIERINDUSTRIE),
For primary bibliographic entry see Field 5D.
W79-03406

THE CLOSED WATER CIRCUIT OF THE ALZENAU FLUTING BOARD AND PAPER MILL (DER GESCHLOSSENE WASSERKREISLAUF

DER WELLPAPPEN- UND PAPIERFABRIK ALZENAU),
Der Papiermacher, Vol. 28, No. 6, p. 92-94, June 10, 1978. 1 fig, 3 illus.

Descriptors: *Water conservation, *Pulp and paper industry, *Closed systems, Waste water treatment, Water pollution sources, Water pollution treatment, Effluents, Flocculation, Sludge, Freshwater, Evaporation, Foreign countries, Recycling, Chemical precipitation, Water quality control, Germany, Corrugating medium(Fluting paper), Linerboard, Board mills, Industrial water.

The water circuit of the mill's fourdrinier machine with secondary former manufacturing 100 tons/day of test linerboard and corrugating medium was closed. The system used involves mixing the effluent with a flocculating agent and pumping it to a contact-sludge clarifier with a capacity of 600 cu m, where the solids content is reduced from 1830 to 15 mg/liter at a throughput rate of 3000 liters/min. Fresh water is still added to the mill's process water to make up for the 120 cu m of water evaporated daily by the paper machine drying cylinders. (Speckhard-IPC)
W79-03407

THE CLOSED CYCLE CONCEPT KRAFT MILL AT THE GREAT LAKES PAPER CO., LTD.,
Great Lakes Paper Co., Ltd., Thunder Bay (Ontario).
J. A. Isbister, D. W. Reeve, and W. H. Rapson.
Pima (Paper Industry Management Association) Magazine, Vol. 60, No. 8, p. 23-29, August 1978. 3 fig, 9 ref, 6 tab.

Descriptors: *Water conservation, *Kraft mills, *Water pollution control, *Closed systems, Water pollution sources, Operation and maintenance, Canada, Foreign countries, Pulp wastes, Bleaching wastes, Foaming, Pulp and paper industry, Salts, Corrosion, Equipment, Spill control, Black liquor, Condensates, Recycling.

Problems encountered, their solutions, and the operating results to date are reviewed following the startup of the salt removal process in March 1977 at the closed-cycle bleached kraft market pulp mill of Great Lakes Paper Co. Ltd. in Thunder Bay, Ontario. Flowsheets and brief descriptions are presented for the bleach plant filtrate recovery system, the closed brown stock screening and brown decker-washer system, and the salt recovery operations. The spill control system and stripping of black liquor evaporator condensates are also discussed. Corrosion of the recovery furnace precipitator and bleach plant towers, foaming in the bleach plant and brown stock decker seal tanks, and an increase in chemical consumption in the D/C and D-1 bleaching stages (D = chlorine dioxide and C = chlorination) have been noted. (Swichtenberg-IPC)
W79-03409

POLLUTION CONTROL REGULATIONS AND MONITORING TECHNOLOGY: A REVIEW OF RESEARCH AND DEVELOPMENT FROM THE PULP AND PAPER INDUSTRY,
Victoria Univ. (British Columbia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-03410

3F. Conservation In Agriculture

A FIELD STUDY OF THE EFFECT OF WATER DEFICIT ON WATER USE EFFICIENCY,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2I.
W79-03036

EVALUATION OF URBANIZATION AND CHANGES IN LAND USE ON THE WATER RESOURCES OF MOUNTAIN VALLEYS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W79-03042

TRANSIENT AND STEADY FLOW FROM SUBSURFACE LINE SOURCES AT CONSTANT HYDRAULIC HEAD IN ANISOTROPIC SOIL,
Science and Education Administration, Riverside, CA. Salinity Lab.
For primary bibliographic entry see Field 2G.
W79-03048

RESPONSIVENESS OF SOIL EROSION LOSSES IN THE CORN BELT TO INCREASED DEMANDS FOR AGRICULTURAL PRODUCTS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
D. C. Cory, and J. F. Timmons.
Journal of Soil and Water Conservation, Vol 33, No 5, p 221-226, September 1978. 1 fig, 4 tab, 24 ref.

Descriptors: *Erosion, *Iowa, *Illinois, *Corn belt, Soil erosion, Agriculture, Export, Economics, Equations, Model studies, Soil losses, Soil erosion losses, Regional model, Universal soil loss equation.

The estimated soil erosion losses resulting from increased agricultural production between a base period, 1969-1971, and 1985 in 12 Corn Belt states under two future scenarios were examined. These scenarios are composed of alternative sets of export demands, land management and eroson control practices, product prices, and farm policies. Scenario I, which assumes a continuation of historical trends, results in a 17% increase in planted crop acres and a 39% increase in soil erosion losses. These losses vary from 68% in Iowa to 8% in Kansas. Scenario II, featuring increased production because of higher exports, results in a 29% increase in planted crop acres and a 72% increase in soil erosion losses. The losses in this case vary from 106% in Iowa to 40% in Illinois. (Lee-ISWS)
W79-03064

FATE OF HERBICIDES CNP IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5B.
W79-03065

SYSTEMS ANALYSIS APPLIED TO AGRICULTURAL WATER DEMAND,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W79-03087

ROW SPACING AND DIRECTION EFFECTS ON WATER UPTAKE CHARACTERISTICS OF PEANUTS,
Oklahoma State Univ., Stillwater.
E. W. Chin Choy, J. F. Stone, and J. E. Garton.
Soil Science Society of America Journal, Vol. 41, No. 2, p 428-432, March-April, 1977. 5 fig, 2 tab, 14 ref.

Descriptors: *Evapotranspiration, *Peanuts, Crop response, Crop production, *Cultivation, *Row spacing, Water utilization.

Peanuts grown in 30-cm wide, north-south rows, lost less water to evapotranspiration than those grown in 90-cm rows or than east-west rows of these spacings. Plants grown in 90-cm wide, north-south rows tended to have the highest water losses. The reason for this phenomen was not determined, although there is reason to believe net radiation is lower in narrow rows than wide. Yield of peanuts was enhanced by the narrow rows and no orientation effect on yield was noted. This, water-use efficiency was increased by both yield effect and water conservation effect. Peanut quality was the same for all treatments. There is no reason to believe that the water conserving effect is unique to peanuts. Research on other crops in similar geometries is to be encouraged. (Skogerboe-Colorado State)
W79-03094

A METEOROLOGICAL APPROACH TO THE IDENTIFICATION OF DROUGHT SENSITIVE PERIODS IN FIELD CROPS,
Orange Free State Univ., Bloemfontein (South Africa).
For primary bibliographic entry see Field 2B.
W79-03130

ALTERNATIVES FOR MANAGING A FINITE GROUNDWATER SUPPLY IN AN ARID REGION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W79-03131

A 'NEW WEST' RECLAMATION TRAGEDY, THE TWIN FALLS-OAKLEY PROJECT IN IDAHO, 1908-1931,
Boise State Univ., ID.
H. T. Lovin.
Arizona and the West, Vol. 20, No. 1, p. 5-24, Spring 1978. 4 fig, 30 ref.

Descriptors: *History, *Irrigation districts, *Idaho, *Reclamation states, *Land reclamation, Political aspects, Social aspects, Legislation, Water rights, Project feasibility, Economic impact, *Twin Falls-Oakley Project(Ida), Snake River plain(Ida).

Under the Newlands and Carey Acts, the sparsely inhabited arid regions west of the Rockies became known at the turn of the century as the New West, the site of dozens of Federal and state reclamation projects. One such, the Twin Falls-Oakley project on the study of the difficulties of settling this uncertain landscape, unfamiliar to its new settlers. In this historical account we learn that the project was speedily approved by the Idaho Land Board and 43,893 acres segregated for construction of irrigation works capable of serving the region, with the promoters obtaining the rights to sell water rights and services to the area's farmers. The district opened in 1909 with high expections on the part of investors risking sums calculated between one and a half and two and a quarter million dollars. But misfortune and bad planning beset the project from the beginning. The lack of proper soil, geological, or water studies, together with engineering miscalculations caused long delays and serious physical problems, which in turn precipitated financial and political difficulties that haunted the district until 1931 when litigation ceased with practically everybody the loser. Implications for subsequent reclamation project can be read into the details of this early disaster. (Tickes-Arizona)
W79-03132

ANTHROPOGENIC IMPACT ON THE ALBEDO OF THE EARTH,
Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.
For primary bibliographic entry see Field 2B.
W79-03134

ISRAEL: WHERE IRRIGATION IS AN ART,
R. Ross.
Irrigation Age, Vol. 13, No. 2, p 66-68, October, 1978. 3 fig.

Descriptors: *Irrigation operation and maintenance, *Irrigation systems, *Irrigation practices, Distribution systems, Computer programs, Water conservation, Labor supply, Management, *Israel.

A coordinated irrigation control system at Kibbutz Saad in Israel is described. The system, including its master control station, field units, and electric solenoids has greatly reduced irrigation labor requirements for this and other settlements in this small progressive country. The operation and function of the system, developed by Motorola Israel

td. is described, from the initial decision to com-
uterize to the release of water and the trouble-
ooting abilities of the field units. In addition to
inimizing labor and error, the system has been
ound to aid in water conservation and utilization
forts, help produce higher yields, and refine man-
gement techniques. (Tickes-Arizona)
/79-03136

**INIMUM STREAMFLOWS: THE LEGISLA-
IVE ALTERNATIVES,**
or primary bibliographic entry see Field 6E.
/79-03206

GRICULTURAL WATER QUALITY ACT.
or primary bibliographic entry see Field 6E.
/79-03225

**/ATER FOR FIVE CENTRAL ARIZONA
NDIAN TRIBES FOR FARMING OPER-
TIONS.**
or primary bibliographic entry see Field 6E.
/79-03227

**ROTECTION AND ENHANCEMENT OF
OIL AND WATER RESOURCES.**
or primary bibliographic entry see Field 6E.
/79-03234

**RADE-OFFS BETWEEN EROSION CON-
ROL AND PRODUCTION COSTS IN U.S. AG-
ICULTURE,**
owa State Univ., Ames. Center for Agricultural
nd Rural Development.
or primary bibliographic entry see Field 4D.
/79-03284

**HE PESTICIDE CONTENT OF SURFACE
/ATER DRAINING FROM AGRICULTURAL
IELDS--A REVIEW,**
cience and Education Administration, Stoneville,
IS. Southern Weed Science Lab.
or primary bibliographic entry see Field 5B.
/79-03289

**JUTRIENT RUNOFF FROM FERTILIZED
ND UNFERTILIZED FIELDS IN WESTERN
ANADA,**
Department of Agriculture, Swift Current (Sas-
atchewan). Research Station.
or primary bibliographic entry see Field 5B.
/79-03290

FLUSH-DRIP IRRIGATION EMITTER,
I. H. Christy, and L. Spencer.
J.S. Patent No. 4,113,180, 5 p, 12 fig, 6 ref; Official
Gazette of the United States Patent Office, Vol
74, no 2, p 792, September 12, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation prac-
ces, *Irrigation efficiency, Flow control, Appli-
ation equipment, Flush-drip irrigation.

A flush-drip irrigation emitter includes a compact
mitter element, a housing enclosing the emitter
lement and an insect guard. The emitter element
as a pair of confronting oppositely arched flexible
alls defining a flush flow passage with sharp
ateral edges. One of the walls has at least one drip
uct, the walls being responsive to a minimal pres-
ure difference to collapse against each other in
utual sealing relation and confine flow to the drip
uct. The housing includes telescopable comple-
entary housing components provided with an
let connected to a water supply and an outlet.
he emitter element includes sealing means inter-
osed between the housing components. The hous-
ng components have mutually engageable latch
lements and a tool receiving channel to effect
eparation. The outlet is arranged to receive direct-
y or indirectly through a small irrigation tube, and
nsect guard. (Sinha- OEIS).
W79-03313

HIGH RISE SPRINKLERS,
K. T. Sheets.
U.S. Patent No. 4,113,181, 10 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 793, September 12, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Nozzles, Application equipment, Floats, Water delivery.

High rising projectable sprinklers rise automatically from the ground when water is supplied under pressure to the sprinklers. The projectable sprinklers include a generally cylindrical housing closed at the bottom and sunken in the ground. A projectable float floats upward within the housing when water is supplied under pressure to the sprinkler. The sprinkler head includes a rotating nozzle or nozzles attached to the top of the float. (Sinha - OEIS)
W79-03314

FIELD MEASURED AND SIMULATED CORN LEAF WATER POTENTIAL,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 2I.
W79-03361

STUDIES ON THE USE OF COAGULATION AIDS FOR TREATMENT OF BOILER FEED-WATER (CERCETARI PRIVIND UTILIZAREA ACCELERATORILOR DE COAGULARELA TRATAREA APELOR DE ALIMENTARE A CAZANELOR),
F. Nichifor.
Celuloza si Hirtie, Vol. 26, No. 4, p 162-167, October-December, 1977. 2 fig, 8 tab.

Descriptors: *Boiler feed water, *Water treatment, *Coagulation, Industrial water, Silica, Iron, Hardness(Water), Water softening, Polyacrylamide.

Laboratory studies are reported on the comparative efficiency of several nonionic and anionic commercial coagulants of the Medasol type, as well as of experimental nonionic and anionic, hydrolyzed and nonhydrolyzed polyacrylamide preparations, for the removal of silica, iron, and hardness components from high-pressure boiler feedwaters. (Brown-IPC)
W79-03393

RESPONSE OF CORN TO ZN IN ORTHO- AND PYROPHOSPHATE FERTILIZERS, AS AFFECTED BY SOIL TEMPERATURE AND MOISTURE,
National Fertilizer Development Center, Muscle Shoals, AL.
P. M. Giordano, and J. J. Mortvedt.
Agronomy Journal, Vol. 70, No. 4, p 531-534, July-August, 1978. 2 fig, 2 tab, 8 ref.

Descriptors: *Fertilizers, *Phosphates, Sweet corn, *Zinc, Phosphorus, *Soil temperature, *Soil moisture, Crop response, Plant growth, *Corn.

The purpose of this investigation was to determine the effects of both soil temperature and moisture regimes on the uptake of Zn and P by corn (Zea mays L.) from ZnSO4, granulated with ammonium ortho- and polyphosphate fertilizers and applied to Nolichucky scl (pH 7.6), a Typic Paleudult soil. In a series of greenhouse experiments, corn grown under various soil temperature (16 to 32C) and moisture regimes (0.3 to 0.15 atm) showed a marked reduction in dry matter yield, as well as in Zn and P uptake, at low temperature, but varying soil moisture levels had little effect. Uptake of Zn was greater when triammonium pyrophosphate rather than monoammonium phosphate was the source of applied P, but uptake of P from the two P sources was comparable. Although lower Zn uptake appears to be a function of depressed growth under cool soil conditions, it is likely that deficiency arises because early Zn requirements cannot be met when the available Zn supply is low. Uptake and yield results further suggest that early growth retardation sometimes attributed to Zn devidiency during cool springs also may be related to suppression of P uptake. (Skogerboe-Colorado State)
W79-03399

HYDROLOGIC IMPACT OF GRAZING ON INFILTRATION: A CRITICAL REVIEW,
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4C.
W79-03416

SUGARBEET GENOTYPE, N, AND SOIL MOISTURE AVAILABILITY INTERACTIONS IN COMPONENTS OF BEET YIELD AND QUALITY,
Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
D. W. James, D. L. Doney, J. C. Theurer, and R. L. Hurst.
Agronomy Journal, Vol. 70, No. 4, p. 525-531, July-August, 1978. 8 fig, 2 tab, 16 ref.

Descriptors: *Sugar beets, *Nitrogen, *Soil moisture, Crop response, *Crop production, Varieties.

This study was conducted to investigate the genotype of sugarbeet (Beta vulgaris L.) X soil N and genotype X soil water interaction from a broad genetic base. A series of 20 genetically different genotypes differing in yield, sugar percent, and impurity index potential were field tested in 1974 at four N levels: 0, 84, 210, and 525 kg/ha. In 1975, eight genetically diverse genotypes were field tested at five N levels and four irrigation levels. The soil type was a coarse, loamy mixed mesic family of calcic haploxerolls. Analysis of data were for root yield, sucrose percent, gross sugar, and impurity index. Highly significant main effects due to N in 1974 and 1975 and water in 1975 were observed for all measured parameters. A significant genotype (V) X (N) interaction was obtained in 1974 for all parameters. There was an apparent genotype X water interaction in 1975; however, unbiased statistical inferences could not be made because of the experimental design. These interactions indicate that genetic variation exists such that new cultivars may be developed that give high sugar production at low N levels or are not affected adversely in quality at a high N level. (Skogerboe-Colorado State)
W79-03418

UPTAKE OF CADMIUM FROM PHOSPHATE FERTILIZERS BY PEAS, RADISHES, AND LETTUCE,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 2I.
W79-03424

YIELDS, NUTRIENT REMOVAL, AND NUTRIENT CONCENTRATIONS OF DOUBLE-CROPPED CORN AND SMALL GRAIN SILAGE,
Kentucky Univ., Lexington. Dept. of Agronomy.
L. W. Murdock, and K. L. Wells.
Agronomy Journal, Vol. 70, No. 4, p 573-576, July-August 1978. 7 tab, 7 ref.

Descriptors: *Sweet corn, *Barley, *Oats, *Silage, Crop response, Crop production, Nutrient removal, *Kentucky.

The study was initiated to determine production levels from double-cropped silage, the most compatible small grain species for double-cropped silage, and the rate and method of fertilizer application needed for high production. Field experiments were established on Huntington (fine-silty, mixed mesic fluventic Hapludoll) and Pope (coarse-loamy, mixed, mesic fluventic Dystrochrept) soils. Three fertility levels were tested with 392-128-280, 280-89-232, or 168-54-140 kg/ha of N-P-K being applied each year. Single and split applications of K were studied. Barley (Hordeum vulgare L.) and oats (Avena sativa L.) were compared as small grain species. This study indicates that double-cropped corn and small grain for silage can

result in substantially higher dry matter production per unit land area than single-cropped corn. Large amounts of minerals are removed, however, particularly K, by the smal grain component of the double-cropping system. (Skogerboe-Colorado State)
W79-03426

POTASSIUM UPTAKE BY ONION ROOTS CHARACTERIZED BY POTASSIUM/RUBIDIUM RATIO,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W79-03431

DEPENDABILITY OF SELF-PROPELLED SPRINKLER SYSTEMS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
J. W. Addink.
Irrigation Journal, Vol. 1, No. 2, p 18-19, March-April 1971. OWRT B-039-COLO(8).

Descriptors: *Center-pivot sprinklers, *Sprinkler systems, Automatic irrigation system, Performance.

Center-pivot sprinkler systems have become very popular in the past ten years. However, several center-pivot companies have failed and nearly every company in the business has had failures on individual installations. Four areas play essential roles in determining the success of the systems and the companies manufacturing and selling them. The four areas are: design, sales, setup and service. Each of these areas is discussed.
W79-03441

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SOME LOCAL ECONOMIC IMPACTS OF THE MISSOURI RIVER RESERVOIRS WITHIN SOUTH DAKOTA (EFFECTS OF CONSTRUCTION, RECREATION, AND IRRIGATION AS REVEALED BY ANALYSIS OF SECONDARY DATA),
South Dakota State Univ., Brookings. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-03001

OPTIMIZATION MODEL FOR THE EVALUATION OF FLOOD-CONTROL BENEFITS OF MULTIPURPOSE MULTIRESERVOIR SYSTEMS,
Texas Univ. at Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W79-03044

IMPACT OF HYDROLOGIC UNCERTAINTIES ON FLOOD INSURANCE,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6F.
W79-03053

SOME THEORETICAL AND MEASUREMENT ISSUES IN ECONOMIC ASSESSMENT OF INTERBASIN WATER TRANSFERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 6B.
W79-03080

ANALYZING HYDROLOGIC UNCERTAINTY AND ITS IMPACT UPON DECISION MAKING IN WATER RESOURCES,
Princeton Univ., NJ. Dept. of Civil Engineering.
E. F. Wood.
Advances in Water Resources, Vol. 1, No. 5, p 299-305, September 1978. 4 fig, 2 tab, 23 ref.

Bayesian Inference and Decision Theory tools are applied to the problem of synthetic hydrology when model and parameter uncertainty exist. Issues such as optimal parameter estimation, use of synthetic generation in design problems, and the effects of parameter uncertainty on statistical estimation are discussed and applied to the problem of reservoir storage-yield analysis. It is concluded that parameter and model uncertainty arising from short hydrologic records can have a significant influence upon water resource designs. The decision theory approach will allow an analyst to develop statistical estimators in conjunction with the engineering decision problem at hand, leading to better designs than if the traditional approach were taken. (Bell-Cornell)
W79-03081

INTER-DISTRICT WATER ALLOCATIONS VIA LINEAR PROGRAMMING AND LINEAR PROGRAMMING DECOMPOSITION,
Iowa Univ., Iowa City, Inst. of Hydraulic Research.
M. Seki, and T. E. Croley, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 942, Price codes: A11 in paper copy, A01 in microfiche. IIHR Report No. 207, September 1977. 214 p, 10 fig, 77 tab, 28 ref, 2 appen.

Descriptors: *Water allocation(Policy), *Linear programming, *Watersheds(Basins), *Decomposition technique, *Yamato River basin(Nara, Japan), *Cost minimization, Economic feasibility, Political aspects, Environment, Constraints, water management(Applied), Equations, Mathematical models, Systems analysis, Human factors.

An interdistrict water flow table is developed to account for all water flows within a river basin and to identify all water-related variables for analysis. Linear models are identified for hydrologic variables, environmental variables, human factor variables, water use and water demand. Formulations of economic, political, environmental and population objectives are made along with the constraint formulations of these objectives. Several models of water allocations are thus available with the main objective expressed in the objective function and with all others in constraint form. The equations of continuity and motion are also encapsulated in the model. A case study of the Yamato River basin in Nara, Japan is made, and both linear programming and linear programming decomposition are applied as tools in the minimization of total cost. The final optimum allocation differs little from th existing allocation, indicating the present system is near-optimum with respect to total cost. The decomposition principle application allows for useful insight into decentralized decision making, although it proved to be a poorer tool for analysis in the example. The linear programming formulation and the computer program for analysis with the decomposition principle are presented. (Bell-Cornell)
W79-03091

A NONLINEAR PROGRAMMING ALGORITHM FOR REAL-TIME HOURLY RESERVOIR OPERATIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.
W. S. Chu, and W. W-G. Yeh.
Water Resources Bulletin, Vol. 14, No. 5, p 1048-1063 October 1978. 2 fig, 3 tab, 31 ref.

Descriptors: *Reservoir operation, *Optimization, *Multiple-purpose projects, *Hydroelectric power, *Nonlinear programming, Real-Time, Decision making, Constraint, Methodology, Regression analysis, Reservoir storage, Mathematical models, Systems analysis, Equations, Power output maximization, Lagrangian procedures, Schedule, Shasta Reservoir(Calif), Hourly, *California.

The optimization of real-time operations for a single reservoir system is studied. The objective is to maximize the output of hourly power generation over a period of one day subject to constraints on hourly power schedules, daily flow requirements for water supply and other purposes, and the limitations of the facilities. The problem has a nonlinear concave objective function with nonlinear concave and linear constraints. Nonlinear Duality Theorems and Lagrangian Procedures are applied to solve the problem where the minimization of the Lagrangian is accomplished by a modified gradient projection technique along with an optimal step size determination routine. The dimension of the problem in terms of the number of variables and constraints is reduced by elimating the 24 continuity equations with a special implicit routine. A numerical example is presented using data provided by the Bureau of Reclamation, Sacramento, California. (Bell-Cornell)
W79-03093

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03109

A 'NEW WEST' RECLAMATION TRAGEDY, THE TWIN FALLS-OAKLEY PROJECT IN IDAHO, 1908-1931,
Boise State Univ., ID.
For primary bibliographic entry see Field 3F.
W79-03132

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W79-03140

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W79-03141

SUSQUEHANNA RIVER BASIN STUDY: SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03142

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT A--PLAN FORMULATION.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03143

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT B--PROGRAM SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03144

ACCOMPLISHMENT PLAN, REGION VIII, UTAH LAKE-JORDAN RIVER BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-03149

NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION--1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES.

w England River Basins Commission, Boston,
A.
r primary bibliographic entry see Field 5G.
79-03151

D RIVER OF THE NORTH BASIN.
vironmental Protection Agency, Denver, CO.
gion VIII.
r primary bibliographic entry see Field 5G.
79-03156

OOD PLAIN INFORMATION: ALLEGHENY
VER, POTTER COUNTY PENNSYLVANIA.
my Engineer District, Pittsburgh, PA.
epared for Potter County Planning Commission,
., July 1977. 35 p, 11 fig, 10 plates, 7 tab.

scriptors: *Pennsylvania, *Allegheny
ver(PA), *Flood data, *Peak discharge, Floods,
lirect flood measurement, Flood forecasting,
od profiles, Historic floods, Flood stages,
od peak, Flow duration, Stage-discharge rela-
ns, Flood protection, Non-structural alterna-
es, Warning systems, Control structures, Chan-
improvement, Potter County(PA),
udersport(PA), 100-year flood, 500-year flood,
ulette(PA).

e study area is the flood plain of the Allegheny
ver within the limits of Potter County. The
odplain in Potter County is generally flat con-
ing primarily of farmland, wetland, and low-
d. The communities of Coudersport and Rou-
te have significant residential and industrial de-
opment within the flood plain. Flood data were
tained from an Army Corps Wire Weight Gage,
ging records for similar drainage basins and his-
ical records. The major flood season is from
ecember to April, resulting from heavy rain and
w melt. Large floods can occur at any time.
ere are no flood control dams or reservoirs
ecting floods in Potter County, but a channel
provement project was built by the Common-
alth of Pennsylvania, designed to accomodate a
charge of 10,000 cubic feet per second (cfs) with
minimum of bank overflow. The maximum
own flood occurred at Roulette in July 1942,
th a discharge of 18,500 cfs, reaching a high
ter mark of 1532.5 feet above mean sea level
sl). At the same location the 100-year frequency
od would discharge 18,000 cfs and crest at 153.1
t msl, and the 500-year frequency flood would
charge 28,000 cfs and reach an elevation of
32.9 feet msl. Several bridges in the area would
submerged during high flows, and three are
structive to flood flow. This report provides a
table basis for the adoption of land use controls
guide flood plain development. (Coan-NC)
79-03158

LOOD PLAIN INFORMATION: WHITE
VER, SECOND BRANCH, THIRD BRANCH
ND AYERS BROOK, RANDOLPH AND
ETHEL, VERMONT.
my Engineer District, Waltham, MA.
ecember 1973, 30 p, 14 fig, 22 plates, 6 tab.

escriptors: *Vermont, *Flood data, *Peak dis-
arge, Floods, Flood flow, Indirect flood mea-
rement, Flood forecasting, Flood profiles, His-
ric floods, Flood frequency, Flood stages, Stage-
scharge relations, Flood protection, Non-struc-
ral alternatives, Warning systems, Land use,
ontrol structures, Dam, Reservoirs, Standard
oject Flood, *White River(VT), Randolph(VT),
thel(VT), Ayers Brook(VT), Intermediate Re-
onal Flood.

ne study area includes the White river basin, the
cond Branch, and Third Branch tributaries and
yers Brook. The flood plains of the study area
e relatively narrow and the majority of the land
equally divided between woodlands and agricul-
ral areas. Flood data were obtained from three
S. Geological Survey gaging stations, historic
cords, and topographic maps. Major floods in
e White River Valley have occurred during all
asons of the year except mid-winter. The most
vere floods generally result from intense rainfall.
A major multipurpose dam and reservoir project was authorized as early as 1936, but it is listed in an inactive status. The highest flood on the White River at Bethel occurred in September 1938 with a peak discharge of 32,200 cubic feet per second (cfs); and at West Hartford the worst flood occurred in 1927, discharging 120,000 cfs. The most severe flood recorded on Ayers Brook at Randloph occurred in June 1973, with a peak discharge of 4,070 cfs. Future flood peak discharges for the White River near Bethel would be 64,000 cfs for the Intermediate Regional Flood (IRF) and 103,000 cfs for the Standard Project Flood (SPF). IRF discharges for the Second Branch and Third Branch tributaries occurring at their mouths would be 15,000 cfs and 29,000 cfs, respectively, and the SPF discharges would be 25,000 cfs and 49,000 cfs, respectively. This report provides baseline information for developing a comprehensive flood management program. (Coan-NC)
W79-03159

FLOOD PLAIN INFORMATION: PASSUMPSIC AND MOOSE RIVERS, TOWN OF ST. JOHNSBURY, VERMONT.
Army Engineer District, Waltham, MA.
Prepared for Town of St. Johnsbury, December 1972, 25 p, 10 fig, 12 plates, 7 tab.

Descriptors: *Flood data, *Peak discharge, *Vermont, Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Flood peak, Flood damage, Ice jams, Flood protection, Non-structural alternatives, Flood plain zoning, Warning systems, Land use, Planning, Zoning, Standard project flood.

The study area is the portion of the town of St. Johnsbury, Vermont subject to flooding from the Passumpsic and Moose Rivers. Land use in the flood plains is residential, industrial, and commercial; severe damage has occurred in past floods. Flood data were obtained from four U.S. Geological Survey gauging stations, interviews with local residents, historical records and maps. Major floods occur during all seasons, but the main flood season is Spring. Major causes of floods are a combination of heavy rainfall, snowmelt and ice jamming. There are no existing flood control projects. The highest flood stages on the Passumpsic River were recorded at Passumpsic, VT in November 1927, with an estimated peak discharge of 42,500 cubic feet per second (cfs), cresting at 521.5 feet mean sea level (msl). The worst flood on the Moose River occurred at St. Johnsbury in March 1936, discharging 4,780 cfs, and cresting at 590.7 feet msl. The Intermediate Regional Flood (IRF) on the Passumpsic River (at River Mile 8) and the Moose River (at the mouth) would discharge 33,000 cfs and 11,000 cfs, respectively, while the Standard Project Flood (SPF) would discharge 59,000 cfs and 16,000 cfs, respectively. This report offers a suitable basis for the adoption of land use controls to guide flood plain development. (Coan-NC)
W79-03160

FLOOD PLAIN INFORMATION: WEST BRANCH AND FARMINGTON RIVER, CANTON, NEW HARTFORD, AND BARKHAMSTED, CT.
Army Engineer District, Waltham, MA.
May 1977, 35 p, 19 fig, 17 plates, 6 tab.

Descriptors: *Connecticut, *Flood data, *Flood protection, *Non-structural alternatives, *West Branch(CT), Farmington(CT), Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Peak discharge, Flood peak, Stage-discharge relations, Flood plain insurance, Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, Dams, Reservoirs, Still River(CT), 100-year flood, Flood plain management, Canton(CT), New Hartford(CT), Barkhamsted(CT).

The study area includes the Farmington River Basin and its West Branch, and the Still River, both near the towns of Canton, New Hartford, and Barkhamsted, Connecticut. State park and forest recreation areas make up approximately 40% of the Farmington flood plain near Barkhamsted. Near Canton, the flood plain is primarily used for agriculture or is a wooded area. In the New Hartford area, residential, commercial, and industrial developments are extensive along the Farmington River. Flood data were obtained from U.S. Geological Survey gaging stations, maps, historic records, and interviews with local residents. Three dams designed for flood control and low flow augmentation have been constructed by the New England Corps in the Farmington River drainage basin. The worst flood on the Farmington River was recorded at the Riverton, Connecticut gaging station in August 1955 discharging 81,000 cubic feet per second (cfs) and cresting at 492.5 feet above mean sea level (msl). Torrential rains were cited as the primary cause of this flood. The greatest flood on the Still River was recorded at the Robertsville gage, reaching a peak discharge of 44,000 cfs at an elevation of 527 feet mean sea level. At the Riverton gaging station, peak flows for the 100-year flood would be 21,000 cfs cresting at 483.2 feet msl, and for the 500-year flood peak flows would be 47,000 cfs, cresting at 489 feet msl. Guidelines are presented for flood plain management. The main purpose of this report is to provide guidance for intelligent land use in the river basin. (Coan-UNC)
W79-03161

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER AND WHETSTONE BROOK, BRATTLEBORO, VT.
Army Engineer District, Waltham, MA.
Prepared for the Town of Brattleboro, VT, January 1972. 42 p, 8 fig, 15 plates, 6 tab.

Descriptors: *Vermont, *Flood profiles, *Flood data, *Peak discharge, *Flood protection, *Connecticut River(VT), Brattleboro(VT), *Whetstone Brook(VT), Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Flood peak, Stage-discharge relations, Channels, Ice jams, Non-structural alternatives, Flood plain zoning, Warning systems, Land use, Control structures, Dams, Reservoirs, Standard Project Flood, Intermediate Regional Flood.

The study area includes the Connecticut River flood plain near Brattleboro, VT, West River flood plain, and the watershed around the Whetstone Brook. Only the Whetstone Brook flood plain has any significant development consisting of residential and a small amount of commercial development. Flood data were obtained from photographs, newspaper clippings, historical records, topographic maps, and stream gage records. Flooding along the West River has been significantly reduced since 1960 by the construction of flood control structures at Ball Mountain and Townshend. Whetstone Brook is presently unregulated, and flooding can occur within this basin at any time. The combination of storage behind 5 flood-control structures and upstream from power dams reduces most flood peaks on the Connecticut River near Brattleboro to a manageable level. Flood problems along the West River arise primarily from ice jamming near the mouth of the river. The worst flood recorded on the West River occurred in September 1938 near Newfane, discharging 52,300 cubic feet per second (cfs). Flooding along Whetstone Brook results from a combination of rapid snow melt and warm rain, or by heavy rain alone. One bridge would be obstructive to major floods. The worst recorded flood along the Connecticut River occurred in March 1936, discharging 176,000 cfs. The Intermediate Regional Floods would occur as follows: on the Connecticut River near Vernon Dam discharging 140,000 cfs; on West River near its mouth discharging 30,000 cfs; and on Whetstone Brook near its mouth discharging 7,200 cfs. This report has been prepared to provide basic technical information about flood plain hazards and to serve as a basis for land use planning and management decisions concerning flood plain utilization. (Coan-NC)
W79-03162

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

FLOOD PLAIN INFORMATION: CONNECTICUT RIBER, WEST RIVER, DUMMERSTON, VT.
Army Engineer District, Waltham, MA.
April 1977, 40 p, 13 fig, 17 plates, 6 tab.

Descriptors: *Vermont, *Flood profiles, *Flood data, *Peak discharge, *Connecticut River(VT), *West River(VT), Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Rivers, Watersheds, Flood protection, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Warning systems, Land use, Planning, Zoning, Control structures, Dams, Reservoirs, Dummerston(VT), 100-year flood, 500-year flood, Encroachment limits, Flood plain management.

This report presents baseline data for planning officials interested in using land use management techniques to guide flood plain development and prevent intensification of areas where other flood damage reduction techniques (such as works to modify flooding, and adjustments including flood proofing) might be used in an overall flood plain management program. The report covers the town of Dummerston, Vermont, which is subject to flooding from the Connecticut and West Rivers. Land use is primarily residential and agricultural. Flood data were obtained from three U.S. Geological Survey gaging stations, historical records, topographic maps, and weather records. Spring and fall are the major flood seasons, with flooding caused by snow melt and heavy rains. Tropical storms also cause flooding. Various flood control measures have been undertaken, including construction of 16 dams and reservoirs and enactment of various land use control measures. The greatest flood of record on the Connecticut River occurred in March 1936, discharging 176,000 cubic feet per second (cfs) and cresting at 222.9 feet above mean sea level (msl). On the West River, the largest flood occurred in 1938, discharging 52,300 cfs and cresting at 407 feet msl. More recent large floods occurred in 1960 and 1973. On the Connecticut River, the 100-year flood would discharge 132,000 cfs, and the 500-year flood, 172,000 cfs. Areas of possible future floods are shown by maps, photographs, profiles, and cross-sections. A glossary of relevant terms is provided to clarify information in the report. (Coan-NC)
W79-03163

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY. VOLUME I: MAIN REPORT.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03164

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME II, APPENDIX A: THE ECONOMY AND CHARACTER OF THE MERAMEC,
Washington Univ., St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03165

MERAMEC RIVER, MISSOURI. COMPREHENSIVE BASIN STUDY, VOLUME III. APPENDIX B: WATER NEEDS AND PROBLEMS,
Washington Univ., St. Louis, MO.
For primary bibliographic entry see Field 5G.
W79-03166

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VI. APPENDICES G THROUGH L.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03169

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME VII. APPENDICES M THROUGH S.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03170

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VIII. APPENDIX T: DETAILED COST ESTIMATES.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03171

COMMENTS ON ADVANCE COPY OF SUMMARY REPORT ON MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03172

WATER RESOURCES PROJECT TYPE ACTIVITIES: CHANNEL MODIFICATION GUIDELINES.
Fish and Wildlife Service, Washington, DC. and Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03190

AN APPROACH TO THE OPTIMAL CONTROL OF POLLUTION IN BOUNDARY WATERS,
Guelph Univ. (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-03195

LEGAL RIGHTS IN POTOMAC WATERS, PROCEEDINGS OF A CONFERENCE AT HARPER'S FERRY, WEST VIRGINIA.
Interstate Commission on the Potomac River Basin, Bethesda, MD.
For primary bibliographic entry see Field 6E.
W79-03197

THE DEVELOPMENT OF REGIONAL IMPACT REVIEW PROCESS AND ITS APPLICATION TO GENERAL DEVELOPMENT CORPORATION'S PORT MALABAR DEVELOPMENT IN PALM BAY AND BREVARD COUNTY, FLORIDA,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W79-03198

SUPREME COURT STRIKES NEW BALANCE IN FEDERAL-STATE TENSION OVER WESTERN WATER RIGHTS.
For primary bibliographic entry see Field 6E.
W79-03200

WATER USE PERMITS IN A RIPARIAN STATE: PROBLEMS AND PROPOSALS,
Kentucky Univ., Lexington. School of Law.
For primary bibliographic entry see Field 6E.
W79-03213

ERRONEOUSLY MEANDERED LAKESHORE-THE STATUS OF THE LAW AS IT AFFECTS TITLE AND DISTRIBUTION,
For primary bibliographic entry see Field 6E.
W79-03214

DIRECT SOLUTION TO PROBLEMS OF OPEN CHANNEL TRANSITIONS,
Roorkee Univ. (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-03286

FLOOD FREQUENCY ANALYSIS BY POWER TRANSFORMATION,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-03287

METHOD OF REGULATING THE GROWT OF AQUATIC WEEDS WITH PYRIDINE D RIVATIVES,
Lilly (Eli) and Co., Indianapolis, IN. (Assigne
E. V. Krumkalns.
U.S. Patent No. 4,116,665, 14 p, 4 tab, 3 r
Official Gazette of the United States Patent Offic
Vol. 974, No. 4, p. 1984, September 26, 197

Descriptors: *Patents, *Aquatic weed contr
Channel improvement, Irrigation canals, Irrigati
ditches, Chemical reactions, Inhibition, *Pyridi
derivatives.

A method of regulating the growth of submerg
and floating aquatic weeds comprises of adding
3-substituted pyridinemethane, pyridinemethan
or derivative, to a body of water containing t
submerged and floating aquatic weeds, in quan
ties sufficient to regulate the growth. The a
proach being taken is to limit or inhibit the amou
of growth without killing the weeds. (Sinha
OEIS)
W79-03329

PRINCIPAL USES OF FRESHWATER I FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water R
sources Div.
For primary bibliographic entry see Field 7C.
W79-03338

ANALYSIS OF RUNOFF FROM SMAI DRAINAGE BASINS IN WYOMING,
Geological Survey, Cheyenne, WY. Water R
sources Div.
For primary bibliographic entry see Field 2E.
W79-03345

HYDROLOGIC RECONNAISSANCE OF TH FISH SPRINGS FLAT AREA, TOOELE, JUA AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Wat
Resources Div.
E. L. Bolke, and C. T. Sumsion.
Utah Department of Natural Resources, Salt La
City, Technical Publication No 64, 1978. 30 p,
fig, 1 plate, 8 tab, 25 ref.

Descriptors: *Hydrologic data, *Arid climat
*Utah, *Water quality, *Available water, Surfa
waters, Ephemeral streams, Groundwater, Wat
wells, Water yield, Water utilization, Hydrolog
budget, Desert basins, Western Utah.

The Fish Springs Flat area includes about 5
square miles in western Utah. Total annual preci
tation on the area averages about 7 inches a
totals about 232,000 acre-feet. Fish Springs Wash
the major drainage in the area; and, along wi
numerous smaller washes, it flows only in dire
response to precipitation. Runoff from the area
estimated to be about 2,000 acre-feet per ye
Ground-water recharge from precipitation is abo
4,000 acre-feet annually. Ground-water dischar
is chiefly by springs and evapotranspiration. T
largest springs in the Fish Springs group dischar
about 26,000 acre-feet annually. All other sprin
discharge about 600 acre-feet per year, or ov
about 2 percent of the total spring discharge. D
charge by evapotranspiration is about 8,000 ac
feet per year. Discharge by wells and by subsu
face outflow is negligible. The difference betwe
discharge and local recharge-approximately 31,0
acre-feet--is assumed to enter the Fish Springs F
area by interbasin flow. The estimated amount
water recoverable from storage in the upper 1
feet of saturated valley fill is about 550,000 ac
feet; and most of this water is slightly to moderat
ly saline. The water in the Fish Springs Flat ar
ranges from slightly saline to briny; and the pr
dominant ions in the water are sodium and chl
ride. The water that underlies the mudflats in t
northwest part of the area is briny. Water th
issues from Fish Springs is slightly saline. T
water in the area is not suitable for drinking. T
water that issues from Fish Springs is used f
wildlife management, which includes ponding a
irrigation of vegetation (chiefly saltgrass) in t

ish Springs National, Wildlife Refuge. The water om the wells in the area is used for livestock and ining operations. (Woodard-USGS)
/79-03350

ANK-FULL DISCHARGE OF RIVERS,
Geological Survey, Denver, CO. Water Resources liv.
or primary bibliographic entry see Field 2E.
/79-03351

ISCHARGE DATA AT WATER-QUALITY IONITORING STATIONS IN ARKANSAS, 977 WATER YEAR,
Geological Suvrvey, Little Rock, AR. Water Re- ources Div.
'or primary bibliographic entry see Field 7C.
/79-03354

ESCRIPTION OF DATA-COLLECTION YSTEM AND SYNOPSIS OF SELECTED HY- ROLOGIC DATA FOR SOLDIER CREEK ASIN, KANSAS,
Geological Survey, Lawrence, KS. Water Re- ources Div.
'or primary bibliographic entry see Field 7C.
/79-03355

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1977.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03356

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03357

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1977.
Geological Survey, Indianapolis, IN. Water Re- sources Div.
For primary bibliographic entry see Field 7C.
W79-03358

THE IMPENDING WATER FAMINE,
United Nations Educational, Scientific and Cultur- al Organization, Moscow (USSR). International Hydrological Programme.
For primary bibliographic entry see Field 6B.
W79-03435

WILL DESERTS DRINK ICEBERGS,
For primary bibliographic entry see Field 2C.
W79-03437

FROZEN GROUND PROBABILITIES USING DISCRIMINANT ANALYSIS,
Taiwan Provincial Pingtung Inst. of Agriculture. Dept. of Forestry.
For primary bibliographic entry see Field 2C.
W79-03440

4B. Groundwater Management

GRAVITY ANALYSIS OF THE SUBSURFACE STRUCTURE OF THE UPPER SANTA CRUZ VALLEY, SANTA CRUZ COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W79-03002

HYDROLOGIC AND CHEMICAL ANALYSES OF THE OLD TOWN AND HAMPDEN, MAINE WELL FIELDS WITH REGARD TO THE HIGH IRON AND MANGANESE CONCENTRATION PROBLEM,
Maine Univ. at Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2K.
W79-03038

REMOTE SENSING DETECTION OF PERCHED WATER TABLES, A PILOT STUDY,
California Univ., Santa Barbara. Dept. of Geography.
J. E. Estes, D. S. Simonett, L. R. Tinney, C. E. Ezra, and B. Bowman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 753, Price codes: A05 in paper copy, A01 in microfiche. Calif. Water Resources Center, Davis Tech. Compl. Rept., October 1978, Contrib No 175 ISSN 0575-4941, 8 p. 35 fig, 3 tab, 43 ref, annotated bibliography. (Calif. Water Resources Center Prroj. UCAL-WRC-W-512). OWRT B-181-CAL(1).

Descriptors: *Remote sensing, *Perched water, *Infrared radiation, *Thermal radiation, Electromagnetic waves, Water table, Monitoring, Test wells, Irrigation effects.

The existence of shallow perched water tables associated with agricultural activities affects arid environments. This problem is usually related to irrigation water where percolation is impeded by a low permeable layer within the soil profile. Current methods for detection and monitoring of these tables involve test well drilling and monitoring programs that are both costly and time consuming. Remote sensing techniques have demonstrated well siting and monitoring capabilities and have potential timeliness and cost effectiveness characteristics. This study focuses upon remote sensing techniques within the spectral range 0.4 microgram to 23 cm of the electromagnetic spectrum. Imagery from the visible and reflective infrared (aerial camera and Landsat scanner), thermal infrared (aircraft scanner) and microwave (both active L-band and passive 35 GHz micrad) region have been analyzed. Significant temporal cycles in seasonal fluctuations as well as crop growth stages play important roles in establishing the utility of sensor systems to detect vegetative response to perched water tables. A full year of Landsat data proved useful for assessing vegetative responses, however, low precipitation rates in arid regions and the masking effects of irrigation may limit its use. Results indicate that the thermal infrared region has unique detection capabilities because of differential subsurface heat flows associated with the presence of perched water tables. Temporal aspects are especially important to thermal data collection because of diurnal, seasonal and yearly dynamics of heat fluxes. (Snyder-California)
W79-03040

EVALUATION OF URBANIZATION AND CHANGES IN LAND USE ON THE WATER RESOURCES OF MOUNTAIN VALLEYS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W79-03042

PUBLIC GROUNDWATER SUPPLIES IN PULASKI COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 689, Price codes: A02 in paper copy, A01 in microfiche. Bulletin 60-24, 1978. 9 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Unconsolidated aquifers, *Well data, Gravels, Sand aquifers, Bedrock, Limestones, Groundwater availability, Groundwater, Water sources, Hydrology, Water quality, Water wells, Drillers logs, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers, Pulaski County(IL), Dissolved minerals, Water bearing formations.

All available information on production wells used for public groundwater supplies in Pulaski County, Illinois, was presented. The definition of public water supply is contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. The report included separate descriptions for groundwater supplies of 6 municipalities. These were preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-ISWS)
W79-03045

FIELD INVESTIGATION OF TRACE METALS IN GROUNDWATER FROM FLY ASH DISPOSAL,
Notre Dame Univ., IN.
For primary bibliographic entry see Field 5B.
W79-03055

ALTERNATIVES FOR MANAGING A FINITE GROUNDWATER SUPPLY IN AN ARID REGION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster.
Journal of Arid Environment, Vol. 1, No. 3, p. 275-287, 1978. 5 fig, 2 tab, 13 ref.

Descriptors: *Groundwater basins, *Alternative planning, *Water management(Applied), *Arizona, Water resources development, Water supply development, Inter-basin transfers, Water rights, Non-structural alternatives, *Santa Cruz River basin(Ariz).

This analysis covers the water budget of Arizona in general, and of the Santa Cruz Basin in particular. The City of Tucson is used to illustrate the typical manner in which urban communities in arid regions become totally dependent upon underlying and nearby aquifers for their water. Water withdrawals from both the Avra and Santa Cruz River basins for urban, agricultural, industrial, and mining uses are shown to exceed natural aquifer replenishment by 5676 hectare meters annually. Four water resources management alternatives for reducing groundwater level decline in the Santa Cruz Basin are presented and described: (1) importing water from the Colorado River, (2) exchanging municipal sewage effluent with mines or farms for their fresh water rights, (3) interbasin transfer of water, and (4) retiring farmlands for water rights. These techniques used either singly or in combination must be based on the economic and physical characteristics of the area. It is suggested that the alternatives discussed here have application in similar arid regions throughout the world. (Tickes-Arizona)
W79-03131

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VI. APPENDICES G THROUGH L.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03169

STORING WATER UNDERGROUND: WHAT'S THE AQUI-FER,
Nebraska Univ., Lincoln. School of Law.
For primary bibliographic entry see Field 6E.
W79-03211

WATER AS A LOCATABLE MINERAL: THE HERESY OF THE CHARLESTONE CASE,
For primary bibliographic entry see Field 6E.
W79-03212

WATER USE PERMITS IN A RIPARIAN STATE: PROBLEMS AND PROPOSALS,
Kentucky Univ., Lexington. School of Law.
For primary bibliographic entry see Field 6E.
W79-03213

INTERNATIONAL GROUNDWATER MANAGEMENT: THE CASE OF THE U.S. - MEXICAN FRONTIERS,
New Mexico Univ., Albuquerque. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-03216

THE INTERRELATIONSHIP OF GROUND AND SURFACE WATER: AN ENIGMA TO WESTERN WATER LAW,
For primary bibliographic entry see Field 6E.
W79-03222

DRAINAGE BY PARTIALLY PENETRATING RECHARGE WELLS IN A LEAKY AQUIFER,
India Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W79-03278

A METHOD FOR THE ANALYSIS OF DRAWDOWN FROM MULTIPLE-SOURCE TEST PUMPING,
Southern Water Authority, Eastleigh (England). Directorate of Resource Planning.
T. Keating.
Journal of Hydrology, Vol. 39, No. 1/2, p 185-191, October 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Drawdown, *Pump testing, Analysis, *Least squares method, Transmissivity, Storage coefficient, Aquifer characteristics, Observation wells, Equations, Theoretical analysis, On-site data collections, Wells, Pumping, Computer models, *Multiple-source pumping test.

Presented herein was a method for the computation of transmissivity and storativity from drawdown data measured in an observation well during a multiple-source test pumping in an isotropic homogeneous nonleaky aquifer. The method uses the principle of least squares to obtain the best fit between the observed and predicted drawdowns. A field example was used to illustrate the application of the method. (Visocky-ISWS)
W79-03283

BROMACIL IN LAKELAND SOIL GROUND WATER,
Southeastern Forest Experiment Station, Marianna, FL.
For primary bibliographic entry see Field 5B.
W79-03291

WASTEWATER REUSE BY BIOLOGICAL-CHEMICAL TREATMENT AND GROUNDWATER RECHARGE,
Water Planning for Israel Ltd., Tel-Aviv. Dept. of Sewage Reclamation.
For primary bibliographic entry see Field 5D.
W79-03305

A HYDROLOGIC STUDY OF WATER WELL YIELDS AND GROUNDWATER QUALITY RELATED TO STRATIGRAPHIC AND STRUCTURAL SETTINGS IN WESTERN JACKSON COUNTY, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5A.
W79-03306

PREDICTED TRACE METAL CONCENTRATIONS IN SAINE SEEP WATERS,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W79-03309

INFILTRATION FROM TRIBUTARY STREAMS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-03335

GROUND-WATER RESOURCES OF THE CAPE LOOKOUT NATIONAL SEASHORE, NORTH CARLOINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2L.
W79-03337

WARM SPRINGS, SOUTH ISLAND, NEW ZEALAND, AND THEIR POTENTIALS TO YIELD LAUMONTITE,
Geological Survey, Menlo Park, CA. Water Resources Div.; and Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 2K.
W79-03340

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03341

INFLATABLE STRADDLE PACKERS AND ASSOCIATED EQUIPMENT FOR HYDRAULIC FRACTURING AND HYDROLOGIC TESTING,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7B.
W79-03342

THE HYDROTHERMAL SYSTEM OF LONG VALLEY CALDERA, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
M. L. Sorey, R. E. Lewis, and F. H. Olmsted.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $2.50. Professional Paper 1044-A, 1978. 60 p, 34 fig, 1 plate, 17 tab, 112 ref.

Descriptors: *Geothermal studies, *California, *Model studies, *Heat flow, *Thermal water, Water temperature, Mathematical models, Numerical analysis, Hydrologic properties, Geochemistry, Aquifer characteristics, Hot springs, Depth, Test wells, Evaluation, *Long Valley caldera(Calif), Groundwater reservoir.

Results of previous investigations by the U.S. Geological Survey and limited information from a recently drilled 2.11-km-deep test hole in Long Valley caldera, California, enable a useful conceptual model of the hydrothermal system to be developed. The results obtained from numerical simulations with this model permit a useful determination of a general relation between heat flow and the depth and duration of fluid flow, as well as the effective hydraulic characteristics of the hydrothermal reservoir. The conceptual model is based largely on the following information from previous studies. Seismic-refraction experiments and geological investigations delineate three major rock units: (1) a near-surface layer of low velocity, largely nonindurated sediments and volcanic rocks, (2) an underlying, continuous layer of densely welded Bishop Tuff, and (3) precaldera granitic and metamorphic basement rocks below depths of 2.5 to 3.0 km. Regional heat-flow, seismic-refraction, and teleseismic analyses, and the recent occurrence of extrusive volcanism suggest that magma or partially molten rock exists under the western three-fifths of the caldera at depths of 6 to 8 km. The present-day hydrothermal system is dominated by hot water with aquifer temperatures at depth, estimated from the geochemistry of hot-spring waters, of about 210 to 280 degrees C. (Woodard-USGS)
W79-03343

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCE--MID-ATLANTIC REGION,
Geological Survey, Reston, VA. Water Resources Div.
A. Sinnott, and E. M. Cushing.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $1.60. Professional Paper 813-I, 1978. 32 p, 10 fig, 2 tab, 105 ref.

Descriptors: *Groundwater resources, *Regional analysis, *Aquifer management, *Water supply, *Groundwater availability, Water quality, Aquifer characteristics, Withdrawal, Water yield, Groundwater recharge, Water storage, Water resources development, Projections, Atlantic Coastal Plain, *Mid-Atlantic Region, Hudson River basin, Susquehanna River basin, Potomac River basin, Delaware River basin, James River basin.

The Mid-Atlantic Region covers a total area of about 108,000 square miles. It includes parts of Vermont, Massachusetts, New York, Pennsylvania, Maryland, West Virginia, and Virginia, the entire States of New Jersey and Delaware, and the District of Columbia. It encompasses the entire drainage basins (within the United States), the Hudson, Delaware, Susquehanna, Potomac, and the James River and includes Long Island and the coastal drainage of New Jersey, Delaware, Maryland, and Virginia. Ground water is derived primarily from precipitation. The natural discharge from the aquifers in the region is estimated to be at about 38.6 billion gallons per day; in addition, at least 140-350 trillion gallons is stored in the aquifers. About 949 billion gallons of fresh ground water was withdrawn in 1970. This quantity represents about 9 percent of the total freshwater use of 10,220 billion gallons. Available ground-water reserves indicate that a considerable part of the additional supplies needed for the anticipated increase in economic activity in the region could be developed from ground water. (Woodard-USGS)
W79-03344

PREDICTED WATER-LEVEL AND WATER-QUALITY EFFECTS OF ARTIFICIAL RECHARGE IN THE UPPER COACHELLA VALLEY, CALIFORNIA, USING A FINITE-ELEMENT DIGITAL MODEL,
Geological Survey, Menlo Park CA. Water Resources Div.
L. A. Swain.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 551, A04 in printed copy, A01 in microfiche. Water-Resources Investigations 77-29, April 1978. 54 p, 33 fig, 9 tab, 11 ref.

Descriptors: *Artificial recharge, *Water levels, *Water quality, *Groundwater resources, *Forecasting, Groundwater movement, Model studies, Finite element analysis, Aquifer management, Water supply, Water demand, *California, *Coachella Valley(Calif).

From 1936 to 1974, water levels declined more than 100 feet in the Palm Springs area and 60 feet in the Palm Desert area of the upper Coachella Valley, Calif. Water from the Colorado River Aqueduct is presently being recharged to the basin. The dissolved-solids concentration of native ground water in the recharge area is about 210 mg/liter and that of recharge water ranges from 600 to 750 mg/liter. A finite-element model indicates that without recharge the 1974 water levels in the Palm Springs area will decline 200 feet by the year 2000 because of pumpage. If the aquifer is recharged at a rate from about 7,500 acre-feet per year in 1973 increasing to 61,200 acre-feet per year in 1990 and thereafter, the water level in the Palm Springs area will decline about 20 feet below the 1974 level by 1991 and recover to the 1974 level by 2000. The solute-transport finite-element model of the recharge area indicates that the artificial recharge plume (bounded by the 300-mg/liter line)

move about 1.1 miles downgradient of the harge ponds by 1981 and about 4.5 miles from ponds by 2000. (Woodard-USGS)
9-03346

LL-RESPONSE MODEL OF THE CON-NED AREA, BUNKER HILL GROUND-TER BASIN, SAN BERNARDINO COUNTY, LIFORNIA,
ological Survey, Menlo Park, CA. Water Re-rces Div.
. Durbin, and C. O. Morgan.
ailable from the National Technical Information vice, Springfield, VA 22161 as PB-288 515, A03 printed copy, A01 in microfiche. Water-Re-rces Investigations 77-129, July 1978. 39 p, 20 8 tab, 15 ref.

scriptors: *Groundwater recharge, *Natural re-rge, *Artificial recharge, *Model studies, *Po-tiometric level, Forecasting, Confined water, uifer management, Mathematical models, Com-er models, Analytical techniques, *California, nker Hill ground-water basin(Calif), San Ber-dino County, Well-response model.

e Bunker Hill ground-water basin, in the vicini-of San Bernardino, Calif., is being artificially harged with imported water. Current and ure artificial recharge of the basin may cause the entiometric surface in an area of confined und water to rise above land surface and water flow from uncapped and unplugged wells. This uld cause damage to structures where the soil comes waterlogged and where buried wells gin to flow beneath the structures. A well-re-onse model was used to generate a series of ter-level hydrographs representing the response the ground-water basin to six possible combina-ns of conditions for each well; one pumping e, two artificial-recharge rate, and three natural-harge rates. Inflow to the ground-water basin ceeds outflow for all tested combinations. Ac-rding to model predictions, the accumulation of red ground water resulting from the excess of low is sufficient to cause the water level in the ected wells to rise above land surface for all but e of the combinations of conditions tested. ater levels in wells are predicted to rise above land surface as early as 1981 for the combina-n with the greatest excess of inflow. (Woodard-GS)
79-03347

YDROLOGIC RECONNAISSANCE OF THE-SH SPRINGS FLAT AREA, TOOELE, JUAB, ND MILLARD COUNTIES, UTAH,
eological Survey, Salt Lake City, UT. Water sources Div.
r primary bibliographic entry see Field 4A.
79-03350

HEMICAL AND BACTERIOLOGICAL QUAL-Y OF WATER AT SELECTED SITES IN THE N ANTONIO AREA, TEXAS, FEBRUARY 75 - SEPTEMBER 1977,
eological Survey, San Antonio, TX. Water Re-urces Div.
r primary bibliographic entry see Field 5A.
79-03353

ESCRIPTION OF DATA-COLLECTION YSTEM AND SYNOPSIS OF SELECTED HY-ROLOGIC DATA FOR SOLDIER CREEK ASIN, KANSAS,
eological Survey, Lawrence, KS. Water Re-urces Div.
r primary bibliographic entry see Field 7C.
79-03355

ATER RESOURCES DATA FOR UTAH, ATER YEAR 1977.
eological Survey, Salt Lake City, UT. Water esources Div.
r primary bibliographic entry see Field 7C.
79-03356

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03357

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1977.
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03358

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,
Rhode Island Univ., Kingston. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-03417

4C. Effects On Water Of Man's Non-Water Activities

EVALUATION OF URBANIZATION AND CHANGES IN LAND USE ON THE WATER RESOURCES OF MOUNTAIN VALLEYS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. E. Brockway, and K. P. Grover.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 735, Price codes: A07 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, University of Idaho Research Technical Completion Report, October 1978. 113 p, 42 fig, 7 tab, 10 ref, append. OWRT B-038-IDA(1), 14-34-0001-6701.

Descriptors: *Groundwater models, Aquifers, *Silver Creek-Big Woods(Ida), Model studies, *Idaho, *Land use, *Urbanization, Evaluation, Streams.

Impact of projected changes in land use on aquifer and stream systems of the Big Wood River-Silver Creek area, S. Idaho was evaluated using, finite difference model of the groundwater system. Water table and confined aquifers were simulated. Simulated groundwater levels and spring flows were determined for projected changes in land use. Severe decreases up to 38% in discharge of Silver Creek, a productive spring fed trout stream were projected. Groundwater levels in water table and artesian aquifers could decline up to 16 feet. Most severe impacts will result from conversion of present flood end furrow irrigated land to sprinkler irrigation with attendant decrease in aquifer recharge. 1977 drought, during which irrigation diversions were 28% of 1975 diversions, was simulated and compared with measured data. Reasonable comparisons of simulated and measured groundwater levels and spring flows support the validity of the model as a planning tool.
W79-03042

UTILITY LINE SITING AND WETLAND PRESERVATION,
Wisconsin Univ. Madison. Land Resources.
E. Quigley.
PhD Disseration, May 1977. 210 p, 29 fig, 19 tab, 293 ref, 7 append.

Descriptors: *Wetlands, *Electrical networks, Utilities, Transmission lines, Transmission towers, Aesthetics, Vegetation effects.

Over 70% of the utility lines passing through wetlands parallel other linear land uses in wetlands, primarily roads or railroads; however, only 30% of the lines were immediately adjacent to the road or railroad, resulting in parallel corridors of impact. The most obvious impacts from the lines are that shrubs and trees are cut, and that transmission towers and lines are visable. At some sites, utility lines have significant impact on wetland hydrology and vegetation. Other potential significant impacts include impacts on waterfowl, and microclimatic and radiation impacts. (Steiner-Mass)
W79-03090

ANTHROPOGENIC IMPACT ON THE ALBEDO OF THE EARTH,
Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.
For primary bibliographic entry see Field 2B.
W79-03134

ECOLOGY AND ENVIRONMENT IN THE UNITED ARAB EMIRATES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
J. E. Satchell.
Journal of Arid Environments, Vol. 1, No. 3, p. 201-226, 1978. 7 fig, 4 plates, 86 refs.

Descriptors: *United Arab Emirates, *Deserts, *Ecology, *Data collections, *Salinity, *Irrigation effects, Environmental effects, Desalination, Grazing, Research and development.

Although the United Arab Emirates are world leaders in per capita gross national product, ecological information relevant to the area's natural habitat and the environmental effects of its industrial revolution are scarce or non-existent. This paper attempts to gather together information known concerning its climate, physiography, soils, water, agriculture, indigenous vegetation, terrestrial and marine fauna (including lists of species present), and settlement patterns. Since few crops other than dates can be grown without irrigation, several hundred bore holes have been drilled and sea water desalination plants constructed mainly for the benefit of coastal towns. Salinity problems have plagued many irrigation projects, attributable to salt water intrusion from the Gulf, highly mineralized groundwater, and over use of irrigation water, although here, as with other data, incomplete information precludes absolutes. From this extensive review of what is known about the area, this author cites the following as areas in which ecological research is needed: (1) destructive effects of desert settlement, (2) overstocking as a result of increased fodder production, (3) increased populations of wildlife reservoirs of vector-borne diseases as a result of irrigation and afforestation, (4) depletion of wildlife resources, particularly that caused by coastal development, and (5) effects of marine and atmospheric pollution by coastal industry. (Tickes-Arizona)
W79-03137

BIBLIOGRAPHY OF THE GEOLOGY AND HYDROLOGY OF THE ALBUQUERQUE GREATER URBAN AREA, BERNALILLO AND PARTS OF SANDOVAL, SANTA FE, SOCORRO, TORRANCE, AND VALENCIA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 10C.
W79-03339

URBAN STORM-WATER-QUALITY DATA, PORTLAND, OREGON, AND VICINITY,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03349

HYDROLOGIC AND GEOMORPHIC DATA FROM THE PICEANCE BASIN, COLORADO, 1972-77,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03359

HARVESTING EFFECTS ON SOIL AND WATER IN THE EASTERN HARDWOOD FOREST,
Northeastern Forest Experiment Station, Parsons,

WV. Timber and Watershed Lab.
J. H. Patric.
Southern Journal of Applied Forestry, Vol. 2, No. 3, p. 66-73, August 1978. 7 illus.

Descriptors: *Lumbering, *Forest watersheds, *Forest soils, *Soil erosion, *Water quality, Hardwood, United States, Roads, Road design, Forest fires, Evaporation, Flooding, Nutrients, Fertilizers, Water pollution sources, Water pollution, Water temperature, Water pollution effects.

Soil erosion is a normal geologic process that is accelerated modestly and briefly by logging, even with careful practices. Overland flow seldom occurs in the carefully managed forest; its occurrence on logging roads is a common, though preventable, cause of accelerated erosion. It has not been shown that conventional logging practices decrease soil productivity. Careless logging and road building, especially near stream channels, can accelerate soil erosion substantially. Fire may modestly and briefly accelerate soil erosion. Tree cutting reduces evaporative losses with corresponding gains in stream volume. Logging in scattered blocks has negligible effects on river flooding. Logging temporarily accelerates the release of nutrients from the forest floor, causing some enrichment of streams. Fertilization also enriches streams temporarily. Channel clearing increases water temperature until regrowth restores shading. (Witt-IPC)
W79-03412

HYDROLOGIC IMPACT OF GRAZING ON INFILTRATION: A CRITICAL REVIEW,
Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford, and R. H. Hawkins.
Water Resources Research, Vol. 14, No. 2, p. 305-313, April, 1978. 5 fig, 4 tab, 37 ref.

Descriptors: *Grazing, *Infiltration, *Infiltration rates, Hydrologic aspects, *Reviews, Ranges, Runoff, Hydrographs, Water yield, Range management.

The hydrologic importance of grazing is receiving increased attention on rangelands in the United States. The literature on this topic is fragmented. This paper explores the available literature for information useful in understanding the hydrologic impacts of grazing intensity as related primarily to infiltration and runoff. Generally, data relative to range condition are not adequate for evaluating hydrologic impacts. Data relating grazing intensity to infiltration rates are available, yet distinct limitations are evident. These limitations are discussed in terms of identifying future research needs. The greatest need appears to be a detailed definition of the long-term effects of grazing (by year and season) on infiltration rates as a function of site, range condition, and grazing intensity. Once obtained, infiltration rates must be coupled with an appropriate method for generating runoff volumes, storm hydrographs, and long-term water yields. (Skogerboe-Colorado State)
W79-03416

A PRECARIOUS BALANCE UPSET,
For primary bibliographic entry see Field 2A.
W79-03432

THE SANDS OF WRATH: AMERICA'S DUST BOWL IN RETROSPECT,
Texas Tech Univ., Lubbock.
H. E. Dregne.
UNESCO Courier, July 1977, p 14-17. 3 fig.

Descriptors: *Desertification, *History, *Salinity, *Drainage, *Grazing, *Erosion, Saturated soils, Land use, Irrigation practices, Ecosystems, Arid lands, Water management(Applied).

Three instances of widespread desertification in the U.S. are reviewed to identify and illustrate the nature of arid ecosystems and their low resilience after disturbance. The most recent of these catastrophic events occurred in the semiarid southern Great Plains, an area which came to be known as the dust bowl. A long period of improper management stemming from a lack of understanding or experience in arid regions created land erosion so great that a dust pall spread over the humid eastern U.S. and over the Atlantic. The second case of widespread desertification reviewed here began with the rapid settlement of the arid west in the second half of the 19th century. Increasing numbers of grazing cattle and sheep turned grasslands into arid rangeland by the beginning of the 20th century. Natural reestablishment of a grass cover is difficult under such circumstances, although a general awareness of the problem since 1910 has precipitated productive research on range management that is just now showing benefits. The third instance of desertification discussed here is associated with the rapid expansion of irrigation in the west since the end of the 19th century that has produced waterlogging and salinization problems. Poorly drained soils were heavily irrigated because they occupied low-lying level areas easy to irrigate. Lack of prior knowledge or experience with salination or waterlogging hazards created large tracks of unproductive land difficult to reclaim This author presents this analysis to illustrate how signs of desertification can be recognized and corrective measures taken before massive destruction takes its toll again. (Tickes-Arizona)
W79-03434

ARE DESERTS MAN-MADE,
Cairo Univ., Giza (Egypt).
For primary bibliographic entry see Field 2B.
W79-03436

4D. Watershed Protection

A PARAMETRIC MODEL CALIBRATED WITH A PHYSICALLY BASED MODEL FOR RUNOFF PREDICTION FROM UNGAGED STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W79-03003

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASES II AND III,
Pennsylvania State Univ., University Park. Coll. of Health, Physical Education, and Recreation.
For primary bibliographic entry see Field 6B.
W79-03004

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 5C.
W79-03005

SOIL EROSION CONTROL ON CONSTRUCTION SITES WITH PORTLAND CEMENT,
Science and Education Administration, Oxford, MS. Sedimentation Lab.
M. J. M. Romkens, C. B. Johnson, and D. W. Nelson.
Journal of Soil and Water Conservation, Vol 33, No 5, p 232-235, September 1978. 2 fig, 2 tab, 9 ref.

Descriptors: *Portland cements, *Erosion, *Construction, Soils, Erosion control, Erosion rates, Cements, Soil erosion, Vegetation, Rainfall simulators, Vegetable-cover, Chemical stabilizers.

Simulated rainfall was used to determine the erosion control effects of portland cement on upland soils. Treatments included 4 rates of cement application and 2 methods of cement incorporation on 2 medium-textured soils. The application of 2.50 metric tons of portland cement per hectare (1.1 tons/acre), applied as a suspension on a tilled slope of moderate steepness and length, nearly eliminated soil erosion. Lower rates of cement application proved ineffective in controlling soil erosion while higher application rates resulted in adverse effec on the establishment of vegetative cover. Incorpo ration of cement into the top 2.5 cm (1 inch) of so at the 2.50-metric-ton-per-hectare rate proved ine fective for soil erosion control. (Lee-ISWS)
W79-03058

CALCULATED SNOWPACK EVAPORATIO DURING CHINOOKS ALONG THE EASTER SLOPES OF THE ROCKY MOUNTAINS IN AL BERTA,
Northern Forest Research Center, Edmonton (A berta).
For primary bibliographic entry see Field 2I
W79-03274

TRADE-OFFS BETWEEN EROSION CON TROL AND PRODUCTION COSTS IN U.S. AG RICULTURE,
Iowa State Univ., Ames. Center for Agricultur and Rural Development.
E. O. Heady, and G. F. Vocke.
Journal of Soil and Water Conservation, Vol. 3 No. 5, p 227-230, September-October 1978. 3 fig, tab, 8 ref.

Descriptors: *Erosion control, *Agricultur *Farm management, *Costs, Economics, Econor ic justification, Model studies, Mathematic models, Crops, Crop production, Soils, Soil er sion, Analytical techniques, Tillage practices, So losses.

Trade-offs between erosion control and productio costs were estimated for the nation and 105 pr ducing regions. This analysis employed a linea programming model in which values were place both on soil loss and production costs. The trad off curve derived showed that, nationally, annu soil loss can be reduced from an average of 5.56 2.50 tons per acre with only slight increases production costs. A further reducton to 1.98 to per acre, however, entails much greater cost i creases. Land values and commodity prices follo similar patterns. (Sims-ISWS)
W79-03284

PLANT INDICATORS OF SLOPE INSTABI ITY,
Washington State Univ., Pullman. Dept. of Fores ry and Range Management.
M. W. Pole, and D. R. Satterlund.
Journal of Soil and Water Conservation, Vol. 3 No. 5, p. 230-232, September-October 1978. 2 ta 13 ref.

Descriptors: *Slope stability, *Vegetation, *Fo ests, Plant groupings, Ferns, Shrubs, Landslide Erosion, Rockslides, Mudflows, Sediments, Se erosion, Slopes, Geology, Erosion control, *Pla indicators.

Mass movement on disturbed, unstable slopes n only reduces productivity, but also is a maj source of sediment in wildland areas. Preventio requires the disturbance be avoided on sites wi high potential for mass movement, which, in tur requires that such areas be readily identifiabl Understory plant indicators proved useful in ide tifying 60% of the sites showing evidence of dee seated mass movement, such as rotational slum and earth-flows, in Idaho's Clearwater Nation Forest. The ecological characteristics of plants th proved to be the most useful indicators sugge that ecologically analogous species might be us to identify many similar sites in other regio (Sims-ISWS)
W79-03285

ECONOMICS OF MINED LAND RECLAM TION AND LAND-USE PLANNING IN WES ERN STATES.
Argonne National Lab., IL
For primary bibliographic entry see Field 6B.
W79-03433

ASSESSMENT OF THE EFFECTS OF
RMWATER RUNOFF FROM URBAN WA-
HEDS ON THE WATER QUALITY OF A
EIVING RESERVOIR,
essee Univ., Knoxville.
rimary bibliographic entry see Field 5C.
03005

IFICANCE OF TURBIDITY FOR QUAL-
ASSESSMENT OF AGRICULTURAL
OFF AND IRRIGATION RETURN FLOW,
ington State Univ., Pullman. Dept. of Agri-
al Engineering.
King, D. L. Bassett, and J. M. Ebeling.
able from the National Technical Information
ce, Springfield, VA 22161 as PB-291 730,
codes: A04 in paper copy, A01 in microfiche.
of Washington Water Research Center,
ington State University Project Completion
rt, 1978. 68 p, 12 fig, 9 tab, 26 ref, 4 append.
T A-091-WASH(1). 14-34-0001-7102.

riptors: *Sediments, *Turbidity, Water qual-
unoff, *Irrigation return flow, Erosion, Sur-
rrigation, *Agricultural runoff, Water pollu-
ources.

dity and suspended sediment concentration
measured for both agricultural runoff and
tion return flow. Extensive statistical analysis
ed only minimal correlation. Mie scattering
y was explored to determine the significance
ch factors as particle size, index of refraction,
ntration and angle of scatter for both the
elometer and the transmissiometer. It was
that only particles of less than ten microns in
ter contribute significantly to the measure-
of turbidity. Direct measurement of suspend-
diment for agricultural runoff and irrigation
flow is recommended.
03006

LUATION OF POLLUTION CONTROL IN
SIL FUEL CONVERSION PROCESSES;
IFICATION: SECTION 5. BI-GAS PROC-
ES,
n Research and Engineering Co., Linden, NJ.
primary bibliographic entry see Field 5G.
03019

E COUNTY INDUSTRIAL WASTE
RCES, INVENTORY AND EVALUATION.
onal Field Investigations Center-Denver, CO.
primary bibliographic entry see Field 5B.
-03030

RIC ACID ENHANCEMENT OF COPPER
FATE TOXICITY TO THE BLUE-GREEN
AE APHANIZOMENON FLOS-AQUAE
MICROCYSTIS AERUGINOSA,
puri Univ.-Kansas City. Dept. of Biology.
primary bibliographic entry see Field 5C.
-03037

ROLOGIC AND CHEMICAL ANALYSES
HE OLD TOWN AND HAMPDEN, MAINE
L FIELDS WITH REGARD TO THE HIGH
N AND MANGANESE CONCENTRATION
BLEM,
e Univ. at Orono. Dept. of Civil Engineering.
primary bibliographic entry see Field 2K.
-03038

AUTOMATED DETERMINATION OF LOW
CTIVE PHOSPHORUS CONCENTRA-
NS IN NATURAL WATERS IN THE PRES-
ENCE OF ARSENIC, SILICON AND MERCU-
RIC CHLORIDE,
Department of Scientific and Industrial Research, Taupo (New Zealand), Ecology Div.
M. T. Downes.
Water Research, Vol 12, No 10, p 743-745, 1978. 2 fig, 1 tab, 12 ref.

Descriptors: *Phosphorus, *Chemical analysis, *Analytical technicals, Lakes, *Arsenic, *Silicon, Mercury, Chemical reactions, Water pollution, Pollutants, Pollutant identification, Herbicides, Chemistry, Water chemistry, *Mercuric chloride, Chemical interference.

An automated technique for reactive phosphorus, sensitive to less than 0.5 mg P/cu m, was described. Interference from AsO4(3-)-As and mercuric chloride was removed by thiosulphate in acid solution. The interference from 100 mg AsO4(3-)-As/cu m, 10 g/cu m molybdate-reactive silicon or 60 g/cu m mercuric chloride was equivalent to less than 0.5 mg P/cu m. (Sims-ISWS)
W79-03047

CHEMICAL COMPOSITION OF ACID PRECIPITATION IN PASADENA, CALIF.,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering Science.
H. M. Liljestrand, and J. J. Morgan.
Environmental Science and Technology, Vol 12, No 12, p 1271-1273, November 1978. 1 fig, 2 tab, 16 ref.

Descriptors: *Precipitation(Atmospheric), *Acids, *California, *Chemicals, Rainfall, Sampling, Chemical analysis, Cations, Anions, Ions, Hydrogen ion concentration, Analytical techniques, Model studies, Mathematical models, Water pollution, Water pollution sources, Pollutants, Pollutant identification, *Pasadena(CA), Acid precipitation, *Acid rainfall.

Wet-precipitation-only samplers were used to collect acid rainfall in Pasadena, California, from February 1976 to September 1977. The concentrations of the major cations (H(+), NH4(+), K(+), Ca(2+), and Mg(2+)) and the major anions (Cl(-), NO3(-), SO4(2-)) were determined. The relative importance of different sources was calculated by a chemical balance. The volume weighted mean pH was 4.06, with nitric acid being 32% more important than sulfuric acid. The pH was controlled by the interaction of bases and strong acids. (Sims-ISWS)
W79-03054

FIELD INVESTIGATION OF TRACE METALS IN GROUNDWATER FROM FLY ASH DISPOSAL,
Notre Dame Univ., IN.
For primary bibliographic entry see Field 5B.
W79-03055

TEMPORAL VARIATIONS AND PROBABLE ORIGINS OF HYDROCARBONS IN THE WATER COLUMN OF BEDFORD BASIN, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W79-03062

FATE OF HERBICIDES CNP IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5B.
W79-03065

A COMPARISON OF DISCRETE AND INTENSIVE SAMPLING FOR MEASURING THE LOADS OF NITROGEN AND PHOSPHORUS IN THE RIVER MAIN, COUNTY ANTRIM,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
R. J. Stevens, and R. V. Smith.
Water Research, Vol 12, No 10, p 823-830, 1978. 4 fig, 9 tab, 26 ref.

Descriptors: *Sampling, *Phosphorus, *Nitrogen, *River flow, Nutrients, Water quality, On-site data collections, Rivers, Pollutants, *Pollutant identification, Chemical analysis, Data processing, Statistical models, Water sampling, Water pollution, Fertilizers, *River Main(Northern Ireland), Sampling frequency.

The River Main, County Antrim, was intensively monitored during November 1974 to May 1975 to obtain accurate measurements of the loads of nitrogen and phosphorus to compare with loads predicted by a statistical model from discrete sampling and continuous flow data. During the survey period, 2-hourly samples were collected on 102 days. Flow data were available from continuous recording of river level. Depending on the prevailing flow conditions, 2-hourly or composite 8-hourly samples were analyzed for soluble reactive P, soluble unreactive P, total soluble P, particulate P, total P, nitrate N, Kjeldahl N, and total N. For the discrete sampling program, grab samples were collected at 8-day intervals and analyzed for soluble reactive P, total P, and nitrate N. River flow data showed the 'flashy' nature of the discharge and flow variation by two orders of magnitude. During intensive monitoring, particulate P concentration varied by two orders of magnitude, while all other fractions varied by about one order of magnitude. Therefore, flow was more important in determining loads for all fractions except particulate P. The concentration of all fractions, except soluble unreactive P, were related significantly to flow. Loads and flows generally were related best by log load-log flow equations. The slopes of these equations indicated that soluble reactive P and nitrate N sources were diluted by low concentration water at high flows, whereas particulate P sources increased at high flows due to erosion and surface run-off. (Sims-ISWS)
W79-03066

ACTINIDE ACTIVITIES IN WATER ENTERING THE NORTHERN NORTH SEA,
Deutsches Hydrographisches Inst., Hamburg (Germany, F.R.). Lab. Sulldorf.
C. N. Murray, H. Kautsky, M. Hoppenheit, and M. Domian.
Nature, Vol 276, No 5685, p 225-230, November 16, 1978. 5 fig, 18 ref.

Descriptors: *Pollutants, *Radioisotopes, *Sampling, *Oceans, Water pollution, Cesium, Surveys, On-site data collections, Laboratory tests, Analytical techniques, Path of pollutants, Pollutant identification, *North Sea, Plutonium, Americium, *Actinides.

Surface seawater measurements of 239+240 Pu, 238 Pu, 241 Am and 137 Cs have been carried out in the North Sea and western Atlantic. Statistical analysis demonstrated that the discharges by fuel reprocessing plants in the UK are affecting plutonium activities in these sea areas. A difference in behavior of americium to plutonium was also observed. (Sims-ISWS)
W79-03067

RECENT DEVELOPMENTS IN ATMOSPHERIC CHEMISTRY,
Cambridge Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 2K.
W79-03072

PREDICTING TEMPERATURE TREND IN THE NORTHERN HEMISPHERE TO THE YEAR 2000,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W79-03075

ARSENIC STABILITY IN CONTAMINATED SOILS,

Missouri Univ.-Columbia. Dept. of Agronomy.
R. E. Hess, and R. W. Blanchar.
Soil Science Society of America Journal Vol 40, No. 6, p 847-852 November-December 1976 1 fig, 3 tab, 19 ref.

Descriptors: *Arsenates, Sampling, Soil analysis, Aluminum arsenate, Iron arsenate, Calcium arsenate, Manganese arsenate, Lead arsenate, Manganese oxides, *Pollutant identification, *Missouri, *Arsenic compounds.

Various Al, Ca, Fe, Mn, and Pb arsenate compounds were formed and their solubility products determined. The amount of arsenate in solution for each of the compounds could be predicted as follows: AlAsO4 . 2H2O(pAsO4 = 24.51-3pH), FeAsO4 . 2H2O or Fe(OH)3 . FeAsO4(pAsO4=26.07-3pH), Ca3(AsO4)2 . 14H2O(pAsO4=9.29-1.5pCa), Pb3(Aso4)2 . 4H2O(pAsO4 = 19.75-1.5pPb), and Mn3(AsO4)2 (pAsO4 = 35.6-12.8Eh-2.3pH), or (pAsO4 = 47.3-25.3Eh-3pH), with either Mn2O3 or MnO2. Samples from Sharpsburg and Menfro soils were equilbrated for 7 days at 25 degree C with dilute HCl and NaOH. Aluminum, Fe, Ca, Mn, Pb, and As contents pH and E (platinum) were determined on the solution portions. The values of pA1 + 3pOH, pA1 + pAsO4, pFe + 3pOH, pFE + pAsO4, 3pCA + 2pAsO4, 3pMn + 2pAsO4, and 3pPb + 2pAsO4 were computed for each soil. The values of the ion products indicated that equilibrum solutions from both soils were undersaturated with respect to A1, Fe, ad Ca and that Pb and Mn arsenate were stable in the Menfro and Sharpsburg soils.
W79-03099

DONNAN DIALYSIS MATRIX NORMALIZATION FOR CATHODIC STRIPPING VOLTAMMETRY,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
J. A. Cox, and K. H. Cheng.
Analytical Letters. Vol. A11, No 8, p 653-660, 1978. 1 tab, 7 ref. OWRT-A-087-ILL(4).

Descriptors: *Ion exchange membranes/phosphates, *Dialysis, Arsenate/stripping analysis, Volumetric analysis, *Analytical techniques, *Pollutant identification.

Previously reported cathodic stripping methods for the determination of phosphate and arsenate which were based upon reversible oxidation of Fe(II) to sparingly soluble salts at an inert electrode were subject to several interferences and were influenced by the sample matrix. In the present study Donnan dialysis was used to transfer the test ions from the sample into a controlled electrolyte. Subsequently, stripping analysis was performed. The resulting determinations were independent of the matrix of the original sample over a wide variety of conditions. Using lake water and wastewater samples, results were obtained which were statistically equivalent to widely accepted analytical procedures for trace level determinations.
W79-03103

A RECORD OF THE ACCUMULATION OF SEDIMENT AND TRACE METALS IN A CONNECTICUT, U.S.A., SALT MARSH,
Yale Univ., New Haven, CT.
For primary bibliographic entry see Field 5B.
W79-03113

ENVIRONMENTAL PREFERENCES OF SELECTED FRESHWATER BENTHIC MACROINVERTEBRATES,
Massachusetts Dept. of Environmental Quality Engineering, Westborough. Div. of Water Pollution Control.
S. C. Travis.
Publication No. 10795-103-50-8-78-CR 1978. 93 p, 5 fig, 9 tab, 50 ref, 1 append.

Descriptors: *Benthic fauna, *Bioindicators, *Water pollution effects, *Ecological distribution, On-site data collections, Statistical methods, Niches, Massachusetts, Freshwater, Water quality, Monitoring, Aquatic habitats, Data collections, Discriminant analysis.

Using the concept of niche as an N-dimensional hypervolume, 12 variables were employed to illustrate the physical, chemical and microbiological parameters which provide separation between 25 genera of freshwater benthic macroinvertebrates. The study was based on data collected from 120 sites in the state of Massachusetts by the Massachusetts Division of Water Pollution Control during 1974 and 1975. The range of values under which each genus was collected is reported along with the genus mean for each variable. In a special analysis of organic pollution, a discriminant analysis was performed on dissolved oxygen, biochemical oxygen demand, ammonia and total coliform data. A single discriminant function was sufficient to account for 74.4% of the variation exhibited within the data. This function was used as an index of organic contamination for each station at which one of the 25 genera were collected. The preference exhibited by each genus for organic pollution was taken as its mean value (discriminant score). The analysis demonstrated several statistically significant differences between environmental preferences at the genus level. In particular, levels of organic contamination proved to be operationally significant in providing niche separation. Depth, velocity and substrate preferences also provided some niche separation and were correlated with eutrophic preference, the most pollution-sensitive general being associated with shallow depth, high velocities and complex substrates. However, the more pollution-tolerant types exhibited the broadest habitat distributions.
W79-03128

RESIDUALS MANAGEMENT PRIORITIES FOR THE MONONGAHELA RIVER BASIN.
Resource Planning Associates, Inc., Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03146

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research Taupo (New Zealand). Freshwater Section.
M. T. Downes.
Water Research, Vol. 12, No. 9, 1978, p 673-675. 4 fig, 6 ref.

Descriptors: *Pollutant identification, Freshwater, *Hydrazine reduction, *Methodology, *Nitrates, *Measurement, *Analytical techniques, Lakes, New Zealand, Nutrients, Nitrites, Hydrazine sulfate, Alkalinity, Copper, Zinc, Ions.

An automated method was developed for determining low nitrate levels (which rarely exceed 30 mg/cu m and often are less than 2 mg N/cu m) encountered in three lakes on New Zealand's North Island, in which nitrate is reduced to nitrite with hydrazine sulfate under alkaline conditions in the presence of copper (2+) and zinc (2+). Interferences present in natural water samples are eliminated by addition of zinc (2+) and the copper (2+) catalyst solution. The method compares favorably with the manual copperized cadmium technique for freshwater samples containing 10-800 mg/cu m nitrate-nitrogen. The method is also linear at nitrate concentrations below 10 mg N/cu m, whereas the automated copperized cadmium reduction technique does not have the required sensitivity or precision at low concentrations. With the new method the standard deviation of blanks and of samples containing two mg nitrate-nitrogen/cu m was 0.013 and 0.06 mg N/cu m, respectively, at an analysis rate of 30 samples/hr. The method modifies earlier techniques of Kamphake, et al., and of Mullin and Riley. Deionized distilled water was used throughout. The catalyst solution consisted of 0.0354 g A.R. CuSO4-5H20 plus 0.9 ZnSO4-7H2O in one liter water. Other reagents were 40 g/l sodium hydroxide solution, 1.71 g/l hydrazine sulfate solution, 10 g sulfanilamide solution in one liter 10% A.R. hydrochloric acid, and one g/l N-1-naphthylethylenediamine dihydrochloride. (Lynch-Wisconsin)
W79-03181

SOME FACTORS AFFECTING ON DRY WEIGHT, ORGANIC WEIGHT AND CONCENTRATIONS OF CARBON AND NITROGEN IN FRESHLY PREPARED AND IN PRESERVED ZOOPLANKTON,
Scripps Institution of Oceanography, La Jolla, CA.
M. Omori.
Internationale Revue der Gesamten Hydrobiologie, Vol. 63, No. 2, 1978, p 261-269. 2 fig, 4 tab, ref.

Descriptors: *Zooplankton, Methodology, *Rinsing, *Drying, *Preservation, Weight, *Dry weight, *Organic weight, *Organic matter, *Carbon, *Nitrogen, Calanus sinicus, Pleuromamma xiphias, Acartia tonsa, Sagitta nagae, Copepods, Chaetognatha, Formaldehyde, Ammonium formate, Seawater, Freeze drying, Oven drying.

Effects of three rinses and four preservation techniques on dry weight, organic weight, total carbon, and total nitrogen of zooplankton specimens were evaluated. Rinses were: (1) distilled water, (2) seawater, and (3) ammonium formate. Preservation techniques were: (1) freeze-drying, (2) oven-drying, (3) borax-buffered formaldehyde-seawater solution, and (4) hexamine-buffered formaldehyde solution. Zooplankton tested were the chaetognath Sagitta nagae, and the copepods Calanus sinicus, Pleuromamma xiphias, and Acartia tonsa. Samples rinsed with distilled water were always lighter than samples rinsed with seawater with apparent weight decreases in organic matter and total carbon and nitrogen; losses increased with increasing volume of rinse water. Use of such a hypotonic substance for even a short period may cause osmotic damage to cells and loss of intracellular material; distilled water volume should not exceed 0.3 ml/1 mg dry wt of sample. Isotonic ammonium formate rinse often results in the widest range of variation; on the average organic weight and chemical contents were slightly lower than with filtered seawater. Freeze-drying raised dry and organic weights and chemical composition somewhat higher than for oven-dried samples. The borax-buffered formaldehyde-seawater solution significantly decreased the weight of organic matter and chemical contents within 2.5 days, and after one week loss of organic weight exceeded 20%. Hexamine-buffered formaldehyde produced somewhat different results. (Lynch-Wisconsin)
W79-03184

ORGANIC CARBON-A NONSPECIFIC WATER QUALITY INDICATOR FOR LAKE SUPERIOR,
Minnesota Univ., Minneapolis. Dept. of Civil Mineral Engineering.
W. J. Maier, and W. R. Swain.
Water Research, Vol. 12, No. 8, p 523-529, 2 fig, 3 tab, 22 ref.

Descriptors: *Lake Superior, *Organic carbon, *Water quality indices, *Indicators, *Indicators, *Inorganic carbon, Biochemical oxygen demand, Organic matter, Carbon, Great Lakes, Lakes, Water quality, Combustion, Infrared radiation, Temporal distribution, Spatial distribution, Water pollution effects, Baseline studies, Oligotrophy, Methodology, Analytical techniques.

High total organic carbon (TOC) concentrations in Lake Superior correlated with low water quality (determined by criteria of the International Joint Commission for the Great Lakes), and a scheme relating TOC to water quality for the lake was formulated. Measurement of organic carbon by combustion and infrared absorption is a promising technique for monitoring high quality water, such as found in Lake Superior; BOD is not sufficiently sensitive for characterizing relatively unpolluted waters, and measures only the biodegradable fraction of organics. TOC is a nonspecific test that determines the presence of reduced carbon,

does not differentiate between biodegradable and biochemically refractory materials. Baseline concentrations of organic and inorganic carbon in Lake Superior were established on the basis of samples collected at 21 stations around the lake's perimeter and that of Isle Royale. Temporal and spatial distribution of organic carbon in open waters and in the vicinity of pollution inflows is described. Unpolluted open water averages 1.1 mg/l TOC, and 8-10 mg/l total inorganic carbon (TIC). TOC levels at the surface and at a depth of five ft are indistinguishable. In the vicinity of point pollution sources TOC range 15 3-101 mg/l, the higher value indicating gross pollution. Shoreline or land mass effects were detected in all nearshore samples, where TOC and TIC values were somewhat higher than in open waters. In the Duluth-Superior harbor area TOC was an averaged 12.6 mg/l higher than open water, and TIC 17.1 mg/l higher. (Lynch-Wisconsin)
W79-03186

CONTROL OF WASTE AND WATER POLLUTION FROM POWER PLANT FLUE GAS CLEANING SYSTEMS: FIRST ANNUAL R AND D REPORT,
Aerospace Corp., El Segund, CA. Environment and Energy Conservation Div.
For primary bibliographic entry see Field 5G.
W79-03251

EVALUATION OF SOURCES OF ODOR POLLUTION IN AN AREA OF KANSAS CITY, MISSOURI.
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5G.
W79-03256

CHEMICAL ANALYSIS OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 600, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-430/9-75-005, April 1975. 98 p, 2 tab.

Descriptors: *Water supply, *Water quality standards, *Chemical analysis, *Water data, Statistics, Data collections, Water analysis, Alkalinity, Sodium, Mercury, Iron, Manganese, Dissolved solids, Hardness, Public health, Drinking water.

Tabulated data reporting the chemical analysis of water supply systems serving interstate carriers is reported. Data has been furnished by the state agencies or are from analyses performed by Environmental Protection Agency laboratories. Chemical and related water quality criteria and the effects of the constituents in drinking water are summarized in Table I. The extent of non-compliance with the Drinking Water Standards (DWS) is summarized in Table II; only the number of supplies failing the mandatory limit is indicated when both mandatory and recommended limits are listed for a single constituent. The most common constituents which failed the DWS limits were: iron, manganese, and total dissolved solids. The current DWS does not contain limits for sodium, alkalinity, hardness, pH, or mercury. Mercury limits have been proposed, and concentrations of mercury failing to meet the proposed limit are indicated. Table II is arranged according to EPA regions and the states therein. (Davison-IPA)
W79-03259

DEVELOPMENT OF AN ON-LINE ORGANIC ANALYZER FOR THE MUST WATER PROCESSING ELEMENT,
Abcor, Inc., Wilmington, MA. Walden Div.
K. J. McNulty, R. L. Goldsmith, J. F. McCoy, and A. Zakak.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 116, Price Codes: A03 in paper copy, A01 in microfiche. Final Report, May 1976. 14 p, 6 fig, 2 ref. DAMD 17-75-C-5051.

Descriptors: *Waste water treatment, *Instrumentation, *Organic wastes, Water pollution sources, Carbon, Oxidation, Water pollution treatment, Toxicity, Analyzers, Separation techniques, Organic compounds, Water quality, Waste treatment.

MUST waste treatment systems require an on-line organics monitor to control and monitor the level of organics in the treated effluent. As a first step in the development of such a system, a breadboard total organic carbon (TOC) monitor was designed, built, debugged and tested. The following sequential unit processes were involved in this system: inorganic carbon removal, catalytic oxidation of organic carbon to carbon dioxide, condensation and removal of water vapor, catalytic reduction of carbon dioxide to carbon tetrafluoride, and quantitative analysis for carbon tetrafluoride by flame ionization. Various standard solutions of potassium hydrogen phthalate were used to test the breadboard system; a Dohrmann DC-50 organic analyzer was used to determine the 'true' TOC's of the standard solutions. The breadboard system was in agreement with the commercial analyzer over the entire range of TOC's tested. Its estimated accuracy and linearity are + 1.75 mg/l. It is concluded that this concept using a continuous sample flow is comparable to commercially available TOC analyzers. (Davison-IPA)
W79-03264

PERFORMANCE EVALUATION OF GUILDLINE MODEL 8400 LABORATORY SALINOMETER,
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 7B.
W79-03270

NUTRIENT RUNOFF FROM FERTILIZED AND UNFERTILIZED FIELDS IN WESTERN CANADA,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
For primary bibliographic entry see Field 5B.
W79-03290

A HYDROLOGIC STUDY OF WATER WELL YIELDS AND GROUNDWATER QUALITY RELATED TO STRATIGRAPHIC AND STRUCTURAL SETTINGS IN WESTERN JACKSON COUNTY, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
D. S. Jones, and H. W. Rauch.
January 1978. 24 p, 2 fig, 2 tab, 2 plate, 10 ref, 2 append.

Descriptors: *Groundwater resources, *On-site investigations, *West Virginia, *Ohio River, *Appalachian Mountain Region, Water wells, Water yield, Water quality, Alluvial aquifers, Bedrock, Nitrates, Fractures(Geologic), Aerial photography, Statistical methods, Lineaments.

Chemical and physical parameters for 86 wells and one spring were determined for a portion of western Jackson County, West Virginia. Many of the wells are fairly deep (median depth=165 feet), with the median depth to water being 50 feet. Well yields are relatively low (median yield=2.5 gpm). Valley wells, especially those with in 250 feet of a stream, have higher yields than hilltop or hillside wells. The primary rock aquifer units supplying water to 93% of the area's wells are lower Dunkard to middle-Monongahela in age. The best locations for tapping alluvial aquifers would be on a flood plain or terrace of the Ohio River, where yields of at least 10 gpm can be expected. Wells located within 100 feet of mapped photo-lineaments yield water at significantly greater rates than more distant wells. In general, groundwater quality is considered good. Groundwater in the Sandyville and Ripley quadrangles is usually quite soft. Groundwater in the Kenna quadrangle generally contains low total dissolved solids but often has excessive concentrations of iron. High sodium and chloride concentrations are common south of Cottageville, and a few scattered wells showed evidence of nitrate pollution. (Visocky-ISWS)
W79-03306

PREDICTED TRACE METAL CONCENTRATIONS IN SAINE SEEP WATERS,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W79-03309

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03341

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, FEBRUARY 1975 - SEPTEMBER 1977,
Geological Survey, San Antonio, TX. Water Resources Div.
R. D. Reeves.
Edwards Underground Water District, San Antonio, Tex., November 1978. 33 p, 1 fig, 1 tab, 14 ref.

Descriptors: *Water quality, *Groundwater, *Chemical analysis, *Bacteria, Dissolved solids, Heavy metals, Pesticides, Water suply, Domestic water, Water wells, Springs, *Texas, *San Antonio area(Tex), *Edwards aquifer(Tex).

Water samples collected from 79 wells and 3 springs in the Edwards aquifer in the San Antonio area, Texas, were analyzed for more than 50 properties or constituents, most of which affect the suitability of the water for domestic use. The samples were analyzed for bacteria; major inorgaic constituents; minor elements, including heavy metals; and pesticides. (Woodard-USGS)
W79-03353

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1977 WATER YEAR,
Geological Suvrvey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03354

DESCRIPTION OF DATA-COLLECTION SYSTEM AND SYNOPSIS OF SELECTED HYDROLOGIC DATA FOR SOLDIER CREEK BASIN, KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03355

RAPID WEATHERING PROCESSES OF FUEL OIL IN NATURAL WATERS: ANALYSES AND INTERPRETATIONS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W79-03363

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 5B.
W79-03364

APPLICATION OF THE ROTATED DISK ELECTRODE TO MEASUREMENT OF COPPER COMPLEX DISSOCIATION RATE CONSTANTS IN MARINE COASTAL SAMPLES,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. S. Shuman, and L. C. Michael.
Environmental Science and Technology, Vol. 12, No. 9, p. 1069-1072, September 1978. 7 fig, 18 ref.

Descriptors: *Pollutant identification, *Copper, *Chelation, Metals, Measurement, Water pollution, *Outer Continental Shelf, U.S. Mid-Atlantic coast.

A rotating disk electrode technique was used to estimate dissociation rate constants of copper chelates formed in marine coastal samples, to measure the extend of Cu chelation in these samples, and to establish an operational definition for labile and nonlabile metal complexes based on a kinetic criterion. Samples collected off the mid-Atlantic coast showed various degrees of chelation toward copper. A first order dissociation rate constant for copper chelates was estimated to be of the order of 2 s to the (-1) power. (Sinha-OEIS)
W79-03365

ACCUMULATION OF SATURATED HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATYRHYNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.
For primary bibliographic entry see Field 5C.
W79-03367

POSSIBLE ERRORS CAUSED PRIOR TO MEASUREMENT OF MERCURY IN NATURAL WATERS WITH SPECIAL REFERENCE TO SEAWATER,
Hokkaido Univ., Hakodate (Japan). Dept. of Chemistry.
K. Matsunaga, S. Konishi, and M. Nishimura.
Environmental Science & Technology, Vol. 13, No. 1, p. 63-65, January 1979. 2 fig, 4 tab, 17 ref.

Descriptors: *Mercury, *Measurement, *Water pollution, *Laboratory tests, Sea water, Pollutant identification, Metals, Outer Continental Shelf.

Taking seawater as an example, analytical problems in the mercury determination of natural waters are presented, with a special reference to errors caused prior to measurement of mercury. A mercury concentration of 0.5 ppb decreases rapidly even in an acidified solution, but the presence of sodium chloride prevents the adsorption loss onto the bottle wall. Therefore, if a seawater sample is acidified to 0.2 M with sulfuric acid at sampling, the mercury is stable for at least 60 days. Polyethylene bottles are unreliable because of mercury contamination. Glass bottles contaminated with mercury can be cleaned by heating at 500 deg C or rinsing with diluted hydrofluoric acid. Then there is no contamination and no mercury loss, the apparent mercury concentration an acidified seawater sample increases for a couple of weeks due to a change in form of the mercury species in seawater, and then reaches a constant value which is consistent with the value determined after digestion with a mixture of nitric acid and sulfuric acid, or a mixture of nitric acid and sulfuric acid, or a mixture of nitric acid, potassium permanganate, and persulfate. The level of 5-6 ng of Hg/L determined with the considerations described above seems to be the base-line concentration of mercury in the oceans. (Sinha-OEIS)
W79-03368

MEASUREMENT OF CU AND ZN IN SAN DIEGO BAY BY AUTOMATED ANODIC STRIPPING VOLTAMMETRY,
Naval Ocean Systems Center, San Diego, CA.
A. Zirino, S. H. Lieberman, and C. Claveli.
Environmental Science and Technology, Vol 12, No 1, p 73-79, January 1979. 12 fig, 13 ref.

Descriptors: *Metals, Copper, *Zinc, *Measurement, *Water pollution, Environmental effects, Resources development, Tides, *California, Outer Continental Shelf, *San Diego Bay(CA).

Cu and Zn values were measured in San Diego Bay by annodic stripping voltammetry with a specially built, automated instrument. During 1975-1977, trace metal surveys were conducted in the bay from a small vessel. Samples were collected and analyzed aboard the craft while underway. Cu and Zn concentrations were less than 0.1 and 0.6 micro g/L, respectively, at the mouth of the bay and increased toward the center of the bay to approximately 2.5 and 2.9 micro g/L, respectively. Also, synoptic measurements made at a stationary pier location showed that Cu and Zn concentrations coincided precisely but inversely with tidal cycles. Cu and Zn measurements made by automated anodic stripping voltammetry were compared to measurements made by extraction of Chelex 100 followed by analysis by flame atomization atomic absorption spectrophotometry. The two methods produced values that were indistinguishable within experimental error. (Sinha-OEIS)
W79-03370

CHLORINATED AND SULFONATED DEGRADATION PRODUCTS OF LIGNIN IN THE EFFLUENTS FROM THE CHLORINE BLEACHING OF SULFITE PULP (CHLORIERTE UND SULFONIERTE LIGNINABBAUPRODUKTE IN ABWAESSERN DER CHLORBLEICHE VON SULFITZELLSTOFF),
Technische Hochschule, Darmstadt (Germany, F.R.) Inst. fuer Makromolekulare Chemie.
T. Krause, and G. Widjaja.
Das Papier, Vol. 32, No. 7, p. 279-282, July, 1978. 5 fig, 2 illus, 10 ref, 1 tab. (English summary).

Descriptors: *Bleaching wastes, *Lignins, *Degradation(Decomposition), Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Chlorination, *Spectroscopy, *Ultraviolet radiation, *Infrared radiation, *Chromatography, Sulfonates, *Pollutant identification.

Lignin decomposition products were isolated from the wash waters of the chlorination stage of a spruce sulfite pulp bleach, using the method of Bottger, Krause, and Schurz; cf. Das Papier, Vol. 29, No. 7, p. 305-308, July, 1975. They were examined by UV and IR spectroscopy, and the degrees of chlorination and sulfonation were determined on several fractions obtained by gel chromatographic separation. (Ward-IPC)
W79-03405

POLLUTION CONTROL REGULATIONS AND MONITORING TECHNOLOGY: A REVIEW OF RESEARCH AND DEVELOPMENT FROM THE PULP AND PAPER INDUSTRY,
Victoria Univ. (British Columbia). Dept. of Biology.
D. V. Ellis.
Progress in Water Technology, Vol. 9, p. 673-682, 1977. 17 ref, 1 tab.

Descriptors: *Pulp and paper industry, *Water pollution, *Canada, *Monitoring, *Water quality standards, Foreign countries, Hydrogen ion concentration, Turbidity, Dissolved oxygen, Suspended solids, Toxicity, Water quality, Taste, Odor, Testing procedures, Effluent, Waste dilution, Dispersion, Pulp wastes, Water pollution sources, Instrumentation, British Columbia(Canada).

An environmental monitoring program to meet the requirements of water pollution control in force in British Columbia (Canada) is suggested for the pulp and paper industry. Step I is the monitoring of the numerically restrained receiving water parameter, viz., dissolved oxygen, pH, turbidity, settleable and suspended solids, and toxicity. Step II is the determination of the effluent's zone of influence using water quality parameter. Simple visual, smell, and taste characteristics should not be overlooked. Instrumental tests should include at least those on the numerically restrained parameter, but extended to a 3-dimensional sampling pattern to show dilution and dispersion of the effluent in addition to compliance with the regulations. Biological tests encompassing various levels in and routes through the local food chain are carried out in step III. (Swichtenberg-IPC)
W79-03410

NEW ONLINE SENSOR CHECKS SAVEALL EFFLUENT FOR ITS FIBER CONTENT,
Consolidated Papers, Inc., Wisconsin Rapids, WI.
F. A. Gilbert, Jr., and P. J. Clack.
Pulp and Paper, Vol. 52, No. 9, p. 94-96, August, 1978. 4 fig, 1 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Instrumentation, *Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Turbidity, Filtration, Suspended solids, Savealls, White water(Paper machines), Calcium carbonate, Titanium dioxide, Starch, Clays, Industrial water.

Preliminary investigations by the Wisconsin Rapids Division of Consolidated Papers, Inc showed that turbidity and filtration resistance measurements were not suitable indicators of the solids content of paper mill saveall effluents. The Leeds and Northrup Microtrac suspended solids monitor was more responsive to fiber changes than to filler changes (viz., calcium carbonate, clay, starch, and titanium dioxide) in the saveall effluent. This sensitivity is favorable, since a change in the fiber content of the clarified white water from the savealls is more likely to cause paper machine shower plugging. (Swichtenberg-IPC)
W79-03411

SYSTEM FOR ANALYSIS OF ORGANIC POLLUTANTS IN WATER,
La Trobe Univ., Bundoora (Australia). Dept. of Physical Chemistry.
J. D. Morrison, J. F. Smith, and S. F. Stepan.
Technical Paper No. 28, Australian Water Resources Council, Department of National Resources. Australian Government Publishing Service, Canberra, 1977. 53 p, 29 fig, 13 ref, 3 append.

Descriptors: *Water pollution control, *Organic compounds, *Pollutant identification, *Polymer adsorption method, *Extraction, Computer systems, Gas chromatography, Volatility.

Experience gained in the analysis of organic pollutants in water has resulted in a selection of recommended methods for the detailed analysis of volatile organic compounds in water. A polymer adsorption method removed more than 90% of most organic compounds found as pollutants in water. The extraction method was successfully applied in the laboratory and in the field. A Kuderna-Danish evaporator was the most effective means of concentration after extraction. Packed columns were effective for gas chromatography of simple mixtures and SCOT columns provided better overall performance for complex mixtures. A small selection of liquid phases was sufficient for most samples. A computerized data system was found to be essential for practical use of GC-MS in analysis of water extracts. The system was shown to be effective in solving problems related to the analysis of drinking water and the pollution or ground water, as well as in the analyses of various effluents discharged by industry. (Bell-Graff--Cornell)
W79-03430

EMISSION OF MICROBIAL AEROSOLS FROM POLLUTED WATERS IN DENSELY POPULATED REGIONS,
Kentucky Water Resources Research Inst., Lexington.
L. S. Cronholm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 947, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 117, 1978. 69 p, 8 fig, 12 tab, 36 ref. OWRT A-068-KY(1), 14-34-000107037, 14-34-0001-7038, 14-34-0001-8019.

Descriptors: *Enteric virus, Waste water treatment, *Air pollution effects, Water quality, *Pathogenic bacteria, *Aerosols, *Pollutant identification.

The air surrounding three activated sludge tanks was sampled over a two year period for the emission of bacterial aerosols under a variety of climatic conditions and at varying distances upwind and downwind of the aerated tanks. All plants emitted species of enteric bacteria which are significant as index organisms and as frank pathogens. The emission pattern of these bacteria were influenced by distance from the plant and wind direction. Within the parameters of a plant, defined arbitrarily in this study by sampling sites less than 150 m upwind and less than 900 m downwind, distance from the source was the only reliable predictor of emissions, and no statistical significance was found in the differences between upwind and downwind samples at the same distances from the plant. Multiple regression analysis revealed no consistent influences of any environmental factor or emission rate, but relative humidity, wind speed, air temperature, and ozone levels showed some contribution on the bacterial count, while light intensity appeared to have little influence. The deposition and retention of enteric bacteria on folage plants near aerated basins was used as an alternate sampling method, and it emphasized the potential hazard of these aerosols. This method confirmed the inability to predict the emission rate by climatic factors, but wind speed contributed directly to the counts, and there was a pronounced difference in the average counts of upwind and downwind samples. (Huffsey-Kentucky)
W79-03438

TEST ORGANISMS AND METHODS USEFUL FOR EARLY ASSESSMENT OF ACUTE TOXICITY OF CHEMICALS,
Dow Chemical, Midland, MI. Health and Environmental Research.
E. E. Kenaga.
Environmental Science and Technology, Vol. 12, No. 12, p. 1322-1329, 1978. 8 tab, 25 ref.

Descriptors: *Bioassay, *Chemical properties, *Pesticide toxicity, *Bioindicators, Insecticides, Herbicides, Toxicity, Pesticide residues, Daphnia, Rodents, Rainbow trout, Mallard duck, Shrimp, Analytical techniques, Testing procedures.

Acute toxicity data for 8 organisms commonly used for evaluation of environmental hazards of chemicals were collected and tabulated for 75 insecticides and herbicides. Correlations concerning the usefulness of each species as a selective, sensitive indicator to a wide spectrum of animal organisms were developed in order to provide a basis for selection of toxicity screening tests for use on thousands of industrial chemicals. The objective is to gain a maximum amount of information from a minimum amount of data based on science, and to know the degree of certainty associated with extrapolation of toxicity data from one species to another. On the basis of these correlations, three organisms were found to be the best indicators of acute toxicity to a wide variety of species. These organisms, the rat, one species of fish, and daphnia, are useful for the first round to acute toxicity testing when use and properties of the chemical result in significant environmental exposure. (EIS-Deal)
W79-03450

REGISTRATION OF THIRTY-THREE FISHERY CHEMICALS: STATUS OF RESEARCH AND ESTIMATED COSTS OF REQUIRED CONTRACT STUDIES,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
For primary bibliographic entry see Field 5G.
W79-03452

A COMPARISON OF THE VARIABILITY OF ASELLUS COMMUNIS (CRUSTACEA: ISOPODA) AND GAMMARUS PSEUDOLIMNAEUS (CRUSTACEA: AMPHIPODA) AND SUITABILITY FOR JOINT BIOASSAYS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
D. M. Oseid.

Descriptors: *Bioassay, *Variability, Animal populations, *Crustaceans, Population, Laboratory tests, Testing procedures, Aquatic populations, Predation, Water chemistry, Water quality, Reproduction, Growth rates, Analytical techniques, *Asellus.

These tests indicate that as an individual test organism Asellus has several advantages. It has a lower variability, therefore fewer replications would be required to get the same precision. It can be easily cultured in high numbers in the laboratory and possibly the time to complete a generation is shorter, thereby reducing the time required to do full generation tests. However, apart from variability the tests also showed that in terms of the population parameters the two species produced fairly similar populations. Therefore, when tested in the same test chamber where the two species can interact, both species should have an equal chance to develop a population apart from factors such as competition, predator-prey relations, etc. (EIS-Deal)
W79-03459

ARSENIC CONCENTRATION IN CANNED TUNA FISH AND SARDINE,
Tehran Univ. (Iran). Dept. of Toxicology.
J. V. Karapetian, and A. M. Shahmoradi.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 602-605, 1978. 1 tab, 7 ref.

Descriptors: *Public health, *Heavy metals, Chemical analysis, Commercial fishing, Hazards, Spectrophotometry, Path of pollutants, Water pollution effects, Foods, Food processing, Industry, Water quality standards, *Arsenic compounds, *Arsenic, *Tuna, *Sardines, Tissue analysis, *Caspian Sea, *Persian Gulf.

Twenty samples of canned tuna fish from the Persian Gulf and ten samples of canned sardine from the Caspian Sea were collected. The range of arsenic concentrations in the tuna fish and sardine were 0.65 - 1.00 and 0.9 - 1.20 ppm and the means of the concentrations were 0.78 and 1.00 ppm, respectively. (EIS-Deal)
W79-03485

MERCURY DETERMINATION IN A RIVER OF MOUNT AMIATA,
Siena Univ. (Italy). Chair of Hydrobiology and Fish-Culture.
E. Bacci, C. Leonzio, and A. Renzoni.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 577-581, 1978. 1 fig, 11 ref.

Descriptors: *Mercury, *Mine wastes, *Mussels, Industrial wastes, Heavy metals, Animal metabolism, Path of pollutants, Mineral industry, Waste water treatment, Water pollution sources, Sediments, Molluscs, Tissue analysis, Depuration, Unio.

Since 1970 there has been a drastic reduction in the mining activity of this region because of the reduced world demand for mercury. The levels of mercury in water and mussels have been monitored during this reduction. The Hg level in the abductor muscle of mussels collected in 1973 was about one order of magnitude higher than the levels found in organisms collected in other rivers of Italy. In the years 1974-1976 the Hg concentration in the abductor muscles of specimens collected from the same station was sharply reduced. Reasons for this decrease and for the high background levels of Hg are discussed. (EIS-Deal)
W79-03487

MERCURY BURDENS IN CRAYFISH FROM THE WISCONSIN RIVER,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
T. B. Sheffy.
Environmental Pollution, Vol 17, p 219-225, 1978. 3 fig, 1 tab, 6 ref.

Descriptors: *Crayfish, *Mercury, *Bioindicators, Heavy metals, Wisconsin, Animal pathology, Animal metabolism, Path of pollutants, Industrial wastes, Chemical wastes, Pulp wastes, Bottom sediments, Rivers, Monitoring, Wisconsin, Tissue analysis, Bioaccumulation, *Bioindicators, *Wisconsin River.

Mercury determinations were made on crayfish sampled at 34 locations along the Wisconsin River. Residue levels of mercury in crayfish abdominal muscle ranged from 0.07 to 0.56 ppm on a wet weight basis. The pattern of mercury accumulation in crayfish showed a striking similarity to that in bottom sediment, fish and mammals along the Wisconsin River. Based on this observation, the crayfish seems an accurate and convenient indicator species of mercury contamination along a river system, since it is easily obtained and provides an estimate of organic mercury accumulation for other species from the same area. (EIA-Deal)
W79-03488

THE TECHNICAL VARIABILITY IN BIOTIC INDICES,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
P. M. Murphy.
Environmental Pollution, Vol 17, p 227-235, 1978. 5 fig, 1 tab, 18 ref.

Descriptors: *Bioindicators, *Seasonal, *Mathematical studies, *Statistical methods, Biological communities, Analytical techniques, Fluctuations, Sampling, Water quality, Baseline studies, Mathematical models, Methodology, Monitoring, *Biotic indices, Diversity, Chandler biotic score, Shannon-Weiner Index, Margalef Index, Menhinick Index.

The seasonal stability of six biotic indices used in the assessment of water quality was compared using data obtained from the River Wye and the River Cynon, a polluted tributary of the River Raff (South Wales). It was found that indices utilising a qualitative approach, e.g. Chandler Biotic Score and Average Chandler Biotic Score, gave a far more consistent spatial discrimination between sampling stations than indices based on community diversity, e.g. Shannon-Weiner, Margalef and Menhinick. (EIS-Deal)
W79-03489

AN ASSESSMENT OF THE PERFORMANCE OF DIFFERENT BOTTOM SAMPLERS,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
A. I. Bakanov.
Hydrobiological Journal, Vol 13 (2), 1977, p 88-94. 3 tab, 72 ref. (translated from Russian).

Descriptors: *Methodology, Monitoring, *Benthos, Sampling, On-site investigations, *Bottom sampling, Bottom sediments, Fish diets, Fish food organisms, Efficiencies, *Petersen dredges, *Ekman dredge, Bottom grab sampling, Working efficiencies, Statistical evaluation.

Comparison of the efficiency of the Petersen and Ekman grabs, used for evaluating the food supply of benthophagous fishes, with the modified Ekman bottom grab samplers revealed a statistically significant difference between them. Standard type instruments gave poorer results. The reasons for the unsatisfactory working of the bottom grabs are analyzed. (EIA-Katz)
W79-03495

5B. Sources Of Pollution

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN RUBBER PROCESSING OPERATIONS,
Research Triangle Inst., Research Triangle Park, NC. Center for Technology Applications.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 172, Price codes: A19 in paper copy, A01 in microfiche. Report No. EPA-560/1-75-002, July 1975. Proceedings, Conference on Environmental Aspects

of Chemical Use in Rubber Processing Operations, Akron University, Ohio, March 12-14, 1975. 459 p, 136 fig, 62 tab, 251 ref.

Descriptors: *Rubber, *Industrial wastes, *Conferences, *Environmental effects, *Chemical wastes, Byproducts, Pollution abatement, Odor, Liquid wastes, Effluents, Waste water treatment, Carbon black, Reclamation, Recycling.

Papers are presented and discussed in this, the first of three conferences on the environmental impact of chemicals in various industrial operations. Current chemical use in rubber processing operations, functions of chemicals in the operations, byproducts likely to be used, and measures used or available for use to control environmental contamination are covered. Specific topics include: odor sources, liquid effluents, secondary treatment of waste water, effects of chemicals, carbon black, environmental debris from tires, and reclaiming and recycling rubber. (Gibson-IPA)
W79-03008

STATE-OF-THE-ART SURVEY OF LAND RECLAMATION TECHNOLOGY,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5E.
W79-03025

DADE COUNTY INDUSTRIAL WASTE SOURCES, INVENTORY AND EVALUATION.
National Field Investigations Center-Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 404, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA/33/2-71/003, March 1971. 42 p, 1 fig, 2 tab, 4 ref, 1 append.

Descriptors: *Water pollution sources, *Water quality, *Pollutant identification, *Industrial wastes, *Dade County, Aquifers, Water supply, Sewers, Canals, Miami River, Waste water disposal, Heavy metals, Hazards, Miami, Florida, Data collections.

Results of an industrial waste water inventory conducted from November 28, 1970 through February 1, 1971 in Dade County, Florida are presented. A total of 583 industries were interviewed by telephone and 233 field inspections were made. Fifteen of the 89 industries with significant waste water discharges release wastes into water courses. These include two soft-drink processors and a paper mill. A major portion of the remaining industries, located at Miami International Airport, discharge potentially hazardous wastes from aircraft painting, stripping, and cleaning into canals emptying into the Miami River. These canals eventually become part of the main water supply for Miami, and pollutants discharged into them represent a potential hazard to the Miami water supply. Waste waters of 38 industries are discharged to the domestic sewer systems; some contain concentrations of heavy metals exceeding the criteria regulating the use of sanitary and storm sewers. Toxic compounds in waste water discharges of 36 industries become a source of pollution to the ground water aquifer underlying Dade County, because these wastes are discharged into 'dry wells'. (Davison-IPA)
W79-03030

FIELD INVESTIGATION OF TRACE METALS IN GROUNDWATER FROM FLY ASH DISPOSAL,
Notre Dame Univ., IN.
T. L. Theis, J. D. Westrick, C. L. Hsu, and J. J. Marley.
Journal Water Pollution Control Federation, Vol 50, No 11, p 2457-2469, November 1978. 13 fig, 6 tab, 21 ref. ERDA EY-76-S-02-2727.

Descriptors: *Fly ash, *Trace elements, *Metals, *Groundwater, Water quality, Waste disposal, Water pollution, Water pollution sources, Pollutants, Seepage, Lagoons, Iron, Arsenic, Zinc, Copper, Nickel, Manganese, Lead, Sampling, Powerplants, Fly ash disposal.

Field studies were conducted at the fly ash disposal site of a 735 MW coal-fired power plant. Disposal consisted of ponding the ash, followed by eventual removal, and ultimate deposition as fill. Several sampling wells were made in order to monitor the groundwater quality. Results indicated that trace metals are released to the groundwater from the pond at generally low levels. Metals were found to accumulate in soils at the point of confluence of the pond seepage water with the natural groundwater. Precipitation of insoluble phases and adsorption of metals onto the higher levels of hydrous iron and manganese oxides were considered responsible for this. Nickel was singular in that data suggest that no precipitates were formed and adsorption did not occur under the conditions at the site. (Sims-ISWS)
W79-03055

FATE OF HERBICIDES CNP IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
M. Suzuki, Y. Yamato, and T. Akiyama.
Water Research, Vol 12, No 10, p 777-781, 1978. 4 fig, 3 tab, 16 ref.

Descriptors: *Herbicides, Water pollution, *Farm wastes, Pollutants, *Pollutant identification, Chemicals, Chemical analysis, Sampling, On-site investigations, Laboratory tests, Chemistry, Water chemistry, Path of pollutants, *Water pollution sources, *Japan, *CNP residues.

The occurrence and fate of a herbicide CNP (2,4,6-trichlorophenyl-4'-nitro-phenylether) in rivers and agricultural drainages were investigated. CNP residues in water samples were extracted by adsorption on a macroreticular XAD-2 resin column and were subjected to gas chromatographic analysis using an electron capture detection after desorption from the column and concentration. The minimum detectable amount was 0.04 ng, and a positive identification of CNP residue in water samples was obtained with a combined gas chromatography-mass sptrometry-computer system when 500 ng of CNP was injected. CNP residues were detected in water samples taken in June to September, and these levels were between 0.01 and 16.67 microgram/liter. THe maximum level was found in a sample taken on 13 July 1977, about a month after beginning rice seedling transplantation, and the minimum level was detected on 29 August 1977. However, CNP residue levels were increased again in September because flooded water on the paddy fields was excluded. CNP was more persistent in the aquatic environment than a herbicide benthiocarb. (Sims-ISWS)
W79-03065

A COMPARISON OF DISCRETE AND INTENSIVE SAMPLING FOR MEASURING THE LOADS OF NITROGEN AND PHOSPHORUS IN THE RIVER MAIN, COUNTY ANTRIM,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5A.
W79-03066

ACTINIDE ACTIVITIES IN WATER ENTERING THE NORTHERN NORTH SEA,
Deutsches Hydrographisches Inst., Hamburg (Germany, F.R.). Lab. Sulldorf.
For primary bibliographic entry see Field 5A.
W79-03067

ARSENIC STABILITY IN CONTAMINATED SOILS,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W79-03099

A RECORD OF THE ACCUMULATION OF SEDIMENT AND TRACE METALS IN A CONNECTICUT, U.S.A., SALT MARSH,
Yale Univ., New Haven, CT.
R. J. McCaffrey.
PhD Dissertation, May, 1977. 148 p.

Descriptors: *Salt marshes, *Connecticut, *Trace elements, *Sedimentation rates, Wetlands, Marshes, Metals, Iron, Manganese, Copper, Land use, Air pollution.

Certain trace metals deposited in the salt marsh appear to behave in an analogous, conservative manner. Thus the historical rate of deposition of Mn, Fe, Cu, Zn, Pb, and total inorganic matter on the surface of the marsh may be calculated from the age and sediment properties measured at small depth increments. Changes in the inorganic matter content are attributed to variations in land use on the watershed since it was cleared for agriculture. Fe, Mn, and inorganic matter are principally derived from stream transport of eroding soil, while the observed increased in the fluxes of Cu, Zn, and Pb are largely explained as increased suplly via the atmosphere during the period of the deposition of trace metals from polluted air masses over long periods of time. (Steiner-Mass)
W79-03113

PCB AND THE HOUSATONIC RIVER - A REVIEW AND RECOMMENDATIONS,
Connecticut Academy of Science and Engineering, Hartford; and Connecticut Univ., Storrs. Inst. of Water Resources.
Connecticut Academy of Science and Engineering, Hartford, Connecticut. 1978. B. C. Bell (Editor); A. W. Sweeton, III, Chariman of the ad hoc Technical Committee on Housatonic River Pollution. 25 p, 30 ref. OWRT A-999-CONN(17), 14-34-0001-9007.

Descriptors: *Polychlorinated biphebyls, *Coolants, Water pollution effects, *Public health, Fish, *Oysters, Dredging, Reviews, *Connecticut, *Economic effects, *Possible carcinogenicity, *Industrial origin, *Landfill leaching, Atmospheric fallout, *Housatonic River(Conn).

The Housatonic River is contaminated by polychorinated biphenyls (PCB), which is a class of toxic chemical compounds. These compounds have accumulated in the bottom sediments of the river during a period of over 40 years, largely as a result of their leakage into the river at the General Electric Company plant in Pittsfield, Massachusetts. Their extreme chemical inertness, which made them suitable for industrial application as cooling liquids in electrical capacitors and other electrical equipment, means that the concentration of PCB in the sediments has increased with time. The situation became critical several years ago, when it was discovered that fish in the river contained concentrations of PCB in excess of 5 parts per million, a limit set by the USFDA. Consequently, the State Department of Health in 1977 issued a health advisory against eating fish from the Housatonic. The current report, which is intended as a guide to policymakers, summarizes information about the chemical nature of PCB, the limited information about their toxicity, and the present situationon the Housatonic River. Its major recommendation is that this public health hazard is sufficiently serious that a sustained effort should be made to establish its parameters by monitoring the concentration of PCB in the Housatonic River, in other bodies of water in Connecticut, and in the drainage path of landfills. Other recommendations deal with the need to gain more precise information about PCB and with the exchange of information among the many different government agencies and private organizations that are concerned with different facets of the problem.
W79-03114

DYNAMICS OF POLYCHLORINATED BIPHENYLS IN THE UPPER MISSISSIPPI RIVER. FINAL REPORT. PHASE 1, TASK 1, COMPILATION OF INFORMATION,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03118

DYNAMICS OF POLYCHLORINATED BIPHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT PHASE 1, TASK 2: EVALUATION OF COMPILED INFORMATION,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03119

ACCOMPLISHMENT PLAN, REGION VIII, UTAH LAKE-JORDAN RIVER BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-03149

DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON IN 153 LAKES, RIVERS, AND POOLS IN THE NORTHWEST TERRITORIES,
Canada Environmental Protection Service, Yellowknife (Northwest Territories).
For primary bibliographic entry see Field 5C.
W79-03185

A METHOD FOR THE ANALYSIS OF ENVIRONMENTAL FACTORS CONTROLLING PATTERNS OF SPECIES COMPOSITION IN AQUATIC COMMUNITIES,
Manitoba Univ., Winnepeg. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-03187

THE PESTICIDE CONTENT OF SURFACE WATER DRAINING FROM AGRICULTURAL FIELDS--A REVIEW,
Science and Education Administration, Stoneville, MS. Southern Weed Science Lab.
R. D. Wauchope.
Journal of Environmental Quality, Vol. 7, No. 4, p 459-472, October-December 1978. 3 fig, 4 tab, 69 ref.

Descriptors: *Pesticides, *Runoff, *Agricultural runoff, *Water pollution sources, *Reviews, Water pollution, Herbicides, Insecticides, Pesticide residues, Water quality, Rainfall, Storms, Sediments, Farm management, Agriculture, Bibliographies, *Nonpoint water pollution sources.

The literature on pesticide losses in runoff waters from agricultural fields was reviewed. For the majority of commercial pesticides, total losses are 0.5% or less of the amounts applied, unless severe rainfall conditions occur within 1-2 weeks after application. Exceptions are the organochlorine insecticides, which may lose about 1% regardless of weather pattern because of their long persistence; and soil surface-applied, wettable-powder formulations of herbicides, which may lose up to 5%, depending on weather and slope, because of the ease of washoff of the powder. Pesticides with solubilities of 10 ppm or higher are lost mainly in the water phase of runoff, and erosion control practices will have little effect on such losses. Organochlorine pesticides, paraquat, and arsenical pesticides, however, are important cases of pesticides which are strongly adsorbed by sediments, and erosion control can be important in controlling losses of these compounds. The behavior and fate of pesticides in streams receiving runoff is generally not known. Information on such factors as time and distance of impact of a given runoff event, ability of local ecosystems to recover from transient pesticide concentrations, and dissipation or concentration processes in aquatic ecosystems will have to be obtained before 'edge-of-field' pesticide losses can be related to water quality in receiving waters. (Sims-ISWS)
W79-03289

NUTRIENT RUNOFF FROM FERTILIZED AND UNFERTILIZED FIELDS IN WESTERN CANADA,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
W. Nicholaichuk, and D. W. L. Read.
Journal of Environmental Quality, Vol. 7, No. 4, p 542-544, October-December 1978. 2 tab, 13 ref.

Descriptors: *Nutrients, *Runoff, *Agricultural runoff, *Fertilizers, *Canada, Nitrogen, Phosphorus, Sediments, Erosion, Snowmelt, Crops, Wheat, Water quality, Water pollution, Water pollution sources, Chemicals, Chemical analysis, Sampling, *Saskatchewan(Canada).

Nutrient transport in surface runoff from snow was measured from fertilized and unfertilized cropped and summerfallowed Wood Mountain loam fields in semiarid southwest Saskatchewan. The amount of nitrogen lost from unfertilized fields during spring runoff exceeded the limits purported to result in algal growth; however, the loss was agronomically insignificant. It was concluded that since the N and P concentrations in runoff from unfertilized fertile agricultural soils exceed Saskatchewan Water Quality criteria, these guidelines may be regarded as unattainable under the present system of cereal cropping in western Canada. (Sims-ISWS)
W79-03290

BROMACIL IN LAKELAND SOIL GROUND WATER,
Southeastern Forest Experiment Station, Marianna, FL.
E. A. Hebb, and W. B. Wheeler.
Journal of Environmental Quality, Vol. 7, No. 4, p 598-601, October-December 1978. 1 fig, 1 tab, 21 ref.

Descriptors: *Herbicides, *Groundwater, *Pesticides, *Leaching, Sampling, Chemical analysis, Rainfall, Pesticide residues, Pollutants, *Path of pollutants, Water pollution, Water pollution sources, *Bromacil.

The objective of this study was to evaluate the probable magnitude of the problem of the leaching of pesticides into groundwater under extreme conditions: a sandy soil low in organic matter, a persistent and mobile herbicide applied at a high rate, plentiful rainfall, and a water table within 6 m. Bromacil (5-bromo-3-sec-butyl-6-methyl-uracil) was applied at the rate of 22 kg/ha to a Lakeland sand bearing scrub vegetation of small oaks and poor grasses. Groundwater (at depths ranging from 4.5 to 6 m) was sampled from bromacil residue at weekly intervals for 2 years. Residue was first found in the groundwater 3 months after application and was highest (1.25 ppm) 1 month later. Thereafter the amount declined to less than 0.1 ppm in about a year and less than 0.001 ppm in 2 years. Peaks in residues generally followed periods of increased rainfall by about 2 weeks. Residues (0.24 ppm) were still detected in the surface soil 2 years after application. (Sims-ISWS)
W79-03291

IN WHAT WAY IS WATER POLLUTION INFLUENCED BY SEWERAGE SYSTEMS,
DHV Consulting Engineers, Amersfoort (Netherlands).c
J. B. M. Wiggers, and K. Bakker.
Hydrological Sciences Bulletin, Vol. 23, No. 2, p 257-266, June 1978. 5 fig, 1 tab, 3 ref.

Descriptors: *Sewers, *Drainage systems, *Water pollution, *Model studies, Mathematical models, Combined sewers, Separated sewers, Storm drains, Storm runoff, Urban drainage, Urban hydrology, Storage, Design storm, Flooding, Overflow, Precipitation(Atmospheric), Design, Hydraulic design, Pollution abatement.

A sewerage system was defined, and the sources of pollution were described. The relationship between the amount of pollution and the hydraulic design criteria was outlined. It was shown that in flat or slightly undulating areas, the efficiency of sewer networks can be improved and their costs can be reduced without the need for detailed hydrological investigations. A simulation model of the pollution discharge was presented, and some of the results were discussed. One of the findings is that a combined sewer system can be as effective as a separate system in relation to surface water pollution. This needs to be verified in practice. In order to be able to choose the optimal solutions for pollution abatement, it is important to define the quality of surface water required in a much more accurate way than is done at present. (Sims-ISWS)
W79-03298

MICROBIAL SULFUR CYCLE ACTIVITY AT A WESTERN COAL STRIP MINE,
Montana State Univ., Bozeman. Dept. of Microbiology.
G. J. Olson, and G. A. McFeters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 722, Price codes: A05 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Montana State University, Research Report Number 98, November 1978. 79 p, 5 fig, 14 tab, 71 ref. OWRT A-108-MONT(1), 14-34-0001-8028.

Descriptors: *Water pollution, *Acid mine water, *Sulfur bacteria, *Coal mine wastes, *Strip mine wastes, Decker mine, Wyoming, Sulfate reducing organisms, Acidophilic iron organisms, Thiobacillus ferroxidans.

Certain groups of sulfur cycle bacteria found in waters, sediments, and the coal seams of a strip mine at Decker and other mines of southeastern Montana and northeastern Wyoming were studied. Thiobacillus ferrooxidans, one of the major contributors to acid mine drainage, was consistently detected in the mining environment. Physiological studies of T. ferrooxidans isolates indicated that these acidophilic iron and sulfur oxidizing organisms were typical of the species in their preference for low pH and ability to oxidize pyrite. Since (1) acidic conditions were never observed at Decker, (2) the isolates died off in mine water environments, and (3) no acid could be formed from coal samples inoculated with a T. ferrooxidans isolate, it was thought that their activity was limited to microzones in the coal bearing strata when they oxidized sulfuritic material. Any acid formed was quickly neutralized by bicarbonate heavy metals. Hydrogen sulfide and sulfate reducing bacteria were detected in the water from all but one of the wells samples in over a wide area in southeastern Montana. Although the activity of these organisms in the groundwater could not be demonstrated, a comparison of stable sulfar isotope ratios between groundwater sulfates and sulfides indicated the sulfide was likely produced by sulfate reducing bacteria. (Hunt-Montana)
W79-03308

PREDICTED TRACE METAL CONCENTRATIONS IN SAINE SEEP WATERS,
Montana State Univ., Bozeman. Dept. of Chemistry.
G. K. Pagenkopf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 723, Price codes: A02 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Montana State University Research Report Number 99, November 1978. 20 p, 2 fig, 14 tab, 12 ref. OWRT A-110-MONT(1), 14-34-0001-8028.

Descriptors: *Water pollution sources, *Saline water, *Groundwater, *Seepage, *Pollutant identification, *Trace elements, *Computer models, *Mathematical models, Water chemistry, Soil chemical properties, *Metals, *Montana saline seep areas, Thermodynamic equilibrium model, Ionic activity coefficient, Aluminum, Cadmium, Cobalt, Copper, Nickel, Lead and zinc.

Saline seep waters often contain concentrations of trace metals that are higher than those commonly encountered in non-polluted surface waters. These waters also contain extremely high concentrations of sodium, magnesium and sulfate. An equilibrium model has been developed that predicts the concentrations of aluminum, cadmium, cobalt, copper, nickel, lead, and zinc in the saline seep waters. Ionic activity coefficients are calculated from major component analyses data. Best agreement

between calculated and observed concentrations of trace metals is obtained for aluminum, copper, and lead. Agreement for cadmium and nickel is good provided the pH values are above eight. The solutions appear to be super saturated with respect to cobalt carbonate. Agreement for zinc is good for some samples but poor for others. (Hunt-Montana)
W79-03309

GROUND-WATER RESOURCES OF THE CAPE LOOKOUT NATIONAL SEASHORE, NORTH CARLOINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2L.
W79-03337

PREDICTED WATER-LEVEL AND WATER-QUALITY EFFECTS OF ARTIFICIAL RECHARGE IN THE UPPER COACHELLA VALLEY, CALIFORNIA, USING A FINITE-ELEMENT DIGITAL MODEL,
Geological Survey, Menlo Park CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03346

URBAN STORM-WATER-QUALITY DATA, PORTLAND, OREGON, AND VICINITY,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03349

HYDROLOGIC RECONNAISSANCE OF THE FISH SPRINGS FLAT AREA, TOOELE, JUAB, AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-03350

RAPID WEATHERING PROCESSES OF FUEL OIL IN NATURAL WATERS: ANALYSES AND INTERPRETATIONS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
F. Zurcher, and M. Thuer.
Environmental Science and Technology, Vol 12, No 7, p 838-843, July 1978. 3 fig, 1 tab, 21 ref.

Descriptors: *Weathering, *Oil pollution, *Laboratory tests, *Clay minerals, Fuels, Environmental effects, Resources development, Baseline studies, Suspended solids, Outer Continental Shelf, No. 2 fuel oil.

The fate-determining steps of weathering petroleum in the aquatic environment were studied in model experiments. Capillary column gas chromatography and infrared adsorption measurements showed different weathering processes for No. 2 fuel oil, depending on the turbulence and the level of suspended solids (kaolinite) in water during experiments. Partial dissolution, adsorption, dispersion, and agglomeration of No. 2 fuel oil initially occurred and resulted in the fractionation of the original oil mixture. Alkylated benzenes and naphthalenes were enriched in the water phase (up to 5 mg/l), certain aliphatic hydrocarbons above mol wt 250 were adsorbed onto kaolinite (200 mg/kg), and oil droplets were agglomerated with suspended minerals (20 g/kg) after increased turbulence. The same fractionation pattern was observed for a ground water oil spill, although the oil was already biochemically altered. (Sinha-OEIS)
W79-03363

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
P. A. Meyers, and T. G. Oas.
Environmental Science and Technology, Vol 12, No 8, p 934-937, August 1978. 3 fig, 1 tab, 13 ref.

Descriptors: *Clay minerals, *Oil pollution, *Sediments, *Water pollution, Pollutant identification, Laboratory tests, Hydrocarbons, Petroleum.

Some aspects of the association of hydrocarbons and smectite clay in simulated seawater were investigated using NaCl solutions in laboratory experiments. Both n-eicosane and n-eicosene displayed identical association behaviors with this clay. Association increased linearly with increasing hydrocarbon concentration in water. The amount of n-alkane associated with smectite increased with carbon chain length from C17 to C28, reaching a maximum of 70% removal from water. This may be due to decreased accommodation in water as hydrocarbon chain length becomes larger. The level of association of aromatic hydrocarbons was generally low, and isoalkanes were more effectively removed from water than n-alkanes of the same number of carbons. (Sinha-OEIS)
W79-03364

APPLICATION OF THE ROTATED DISK ELECTRODE TO MEASUREMENT OF COPPER COMPLEX DISSOCIATION RATE CONSTANTS IN MARINE COASTAL SAMPLES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W79-03365

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W79-03366

DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) IN ESTUARINE ECOSYSTEMS. TESTING THE CONCEPT OF EQUILIBRIUM PARTITIONING IN THE MARINE ENVIRONMENT,
URS Co., Seattle, WA.
S. P. Pavlou, and R. N. Dexter.
Environmental Science and Technology, Vol 13, No 1, p 65-71. January 1979. 4 fig, 7 tab, 31 ref.

Descriptors: *Estuarine environment, *Polychlorinated biphenyls, *Ecosystems, Pollutant identification, Water pollution, Environmental effects, *Washington, Path of pollutants, Distribution, Outer Continental Shelf, *Puget Sound(WA).

Spatial and temporal trends in the chlorobiphenyl concentrations observed in various marine components of Puget Sound between 1973 and 1977 are presented. The distribution and accumulation characteristics are discussed in terms of the physical chemical processes that control their flow throughout the ecosystem. For the low levels detected in seawater, the data suggest that uptake is predominantly governed by equilibrium partitioning of the chemicals between suspended phases and ambient water. (Sinha-OEIS)
W79-03369

MEASUREMENT OF CU AND ZN IN SAN DIEGO BAY BY AUTOMATED ANODIC STRIPPING VOLTAMMETRY,
Naval Ocean Systems Center, San Diego, CA.
For primary bibliographic entry see Field 5A.
W79-03370

LIGHT HYDROCARBONS IN RECENT TEXAS CONTINENTAL SHELF AND SLOPE SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Oceanography.
B. B. Bernard, J. M. Brooks, and W. M. Sackett.
Journal of Geophysical Research, Vol 83, No C8, p 4053-4061, August 20, 1978. 7 fig, 3 tab, 24 ref.

Descriptors: *Oil pollution, *Sediments, *Water pollution sources, *Texas, Microbial degradation, *Gulf of Mexico, Outer continental shelf, *Hydrocarbons.

The distributions of the concentrations of methane, ethene, ethane, propene, and propane in twelve 1- to 2-m long gravity cores for two transects from nearshore to midslope off the southwest Texas Gulf Coast are reported. Methane profiles exhibit maxima in the top 40 cm of sediment on the shelf, in contrast to downward increasing gradients in the slope region. Nearshore surface methane concentrations ranging from 50 to 400 micro l (normal temperature and pressure) per liter pore water are apparently due to microbial production in sulfate-free microenvironments such as fecal pellets in a near-seawater sulfate environment. A decrease in sediment methane levels to less than 5 micro l/l pore water in downslope sediments is attributed to reduced microbial activity due to lower organic contents and temperatures. Profiles of the saturated and unsaturated C2 and C3 hydrocarbons suggest that these gases are also microbially produced. (Sinha-OEIS)
W79-03371

AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS,
Engineering-Science, Inc./Texas, Austin.
C. T. White.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 595, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Technical Report No. D-77-25, November 1977. 154 p, 41 fig, 28 tab, 43 ref, append. DACW39-75-C-0125.

Descriptors: *Oil pollution, *Water pollution sources, *Environmental effects, *Dreding, Sediments, Waste disposal, Resources development, Outer Continental Shelf, Dredged material, Grease.

Field studies were conducted at six locations where dredging is practiced, and both water and sediment samples were collected at these sites. The samples were analyzed for various environmental factors with the intent of establishing whether or not release of oil and grease from dredged sediments could be predicted on the basis of the environmental factors. The results of the field study strongly indicated that oil and grease are not released from sediments to a significant extent during the dredging process. It was found that relatively high oil levels in return waters were associated with high suspended solids concentrations, but that the various factors could not be related to the release of oil and grease from sediments. A bench-scale study was devised to delineate the significant factors affecting the release of oil and grease from dredged sediments; however, no consistent relationships were found. The bench-scale results confirmed the field study results in that oil and grease concentrations in the water phase were quite low, even with particularly oily sediments. (Sinha-OEIS)
W79-03377

FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY. RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
C. C. Sarabun, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 692, Price codes: A05 in paper copy, A01 in microfiche. National Science Foundation, Research Applied to National Needs (RANN) Report No. NSF/RA-770307, 1977. 86 p, 17 fig, 3 tab, 6 ref, 3 append. NSF-G141896.

Descriptors: *Oil pollution, River flow, *Water pollution sources, Baseline studies, Delaware River, Resources development, Environmental ef-

ects, Outer Continental Shelf, *Delaware Bay, Crude oil, *Oil slicks, Refineries.

Field studies conducted in the channel north of the Delaware Bay lightering anchorage are discussed. Significant differences are found to exist between the winter-spring season when only a single front occurs, and the summer-fall when multiple, internal waves appear on a persistent near-surface pycnocline. Although the data is not conclusive, some effects of variation in river-flow can be seen. (Sinha-OEIS)
W79-03378

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
R. K. Schwartz, and F. R. Musialowski.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 575, Price codes: A02 in paper copy, A01 in microfiche. Reprint No. 78-6, February 1978. Reprinted from: Coastal Sediments '77, p 85-101. 18 p, 8 fig, 7 ref.

Descriptors: *Sediment transport, *Dredging, *Environmental effects, *Erosion, Sedimentation, Spoil banks, *North Caroina, Outer Continental Shelf, Nearshore processes, Dredge disposal.

During the summer of 1976, 26,750 m of relatively coarse sediment was dredged from New River Inlet, N.C., moved downcoast using a split hull barge, and placed in a 215 m coastal reach between the 2 m and 4 m depth contours. Bathymetric changes on the disposal piles and in the adjacent beach-nearshore area were studied for a thirteen week period to determine the modification of the surrounding beach-nearshore profile and the net transport direction of the disposal sediment. Surveys showed accretion at the base of the foreshore, complete filling of the trough, a platform or new trough at the initial surf-zone bar position, disappearance of the surf-zone bar, and generally a more seaward surf zone boundary. Profiles adjacent to the disposal area showed slight accretion seaward of the surf zone. The predominant transport direction of disposal sediment is interpreted to have been shoreward into the surf zone (in the direction of the coarsest native sand) and then in the direction of the longshore current. The increased width of the platform-disposal bar complex may provide benefits by increasing the amount of wave energy dissipation in the surf zone and hence, less erosion of the beach. (Sinha-OEIS)
W79-03382

CONIFER NEEDLE PROCESSING IN A SUBALPINE LAKE,
Washington Univ., Seattle. Collo of Forest Resources.
G. H. Rau.
Limnology and Oceanography, Vol. 23, No. 2, p 356-358, March, 1978. 1 fig, 17 ref.

Descriptors: *Coniferous trees, *Needles, *Biodegradation, Underwater, Lakes, Lake sediments, Fir trees, Hemlock trees, Washington, Weight, Water pollution, Water pollution sources, Degradation(Decomposition), Findley Lake(Washington), Abies amabilis, Tsuga mertensiana, Waste disposal, Littoral.

The weight loss of fir (Abies amabilis) and hemlock (Tsuga mertensiana) needles introduced into a littoral benthic site in Findley Lake, Washington, was studied. The needles were contained in nylon mesh (0.8 x 0.8 mm or 0.073 x 0.073 mm square mesh) bags or skewered onto stainless steel pins housed in slotted plastic containers. Both fir and hemlock needles lost an average of 80-90% of their initial dry weight after 1-year of incubation. Considerably less mean weight was lost from needles in fine and coarse mesh bags. In all treatments there was little change in mean needle weight during the second year of the experiment. (Witt-IPC)
W79-03400

HARVESTING EFFECTS ON SOIL AND WATER IN THE EASTERN HARDWOOD FOREST,
Northeastern Forest Experiment Station, Parsons, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W79-03412

TMP (THERMOMECHANICAL PULPING) EFFLUENTS -- A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5C.
W79-03414

IMPROVE IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-03420

A STUDY OF NITRIFICATION IN THE DELAWARE RIVER ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
R. B. Tiedemann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 488, Price codes: A12 in paper copy, A01 in microfiche. MS Thesis, June 1977. 259 p, 45 fig, 53 tab, 49 ref, append. OWRT B-054-NJ(1), 14-31-001-5091.

Descriptors: *Estuaries, *Nitrification, *Ammonia, *Water quality, Denitrification, Nutrients, *Delaware River estuary, Benthal deposits, Growth dynamics.

The process of nitrification is evident in a variety of environments and has been studied in the terrestrial and upland river ecosystems. However, a minimum of work has been performed upon nitrification as it applies to the estuarine system. Nitrification in the Delaware River Estuary has been identified to seasonally occur within an upstream and a downstream region with a site of inhibition situated between the two. Nitrosomonas and Nitrobacter populations within the water were held accountable for the bulk of nitrification exhibited in the estuary. Assessments of benthic and wetlands nitrification were not conducted but are considered contributing mechanisms to the total expression of nitrification within the estuarine system. A combination of proper residence time and concentrations of NH3, NO-2, dissolved oxygen, and carbon allow significant nitrification to occur within the water with lengthy residence time being particularly unique to the estuary. Only a small nitrifying seed is required for nitrifying populations to build to considerable levels in the Delaware Estuary. The source of that seed has been reviewed in six hypotheses which may operate individually or in combination. A suggestion for future investigations is the identification of which hypothesized processes are active within the Delaware Estuary and to what degree. (Hunter-Rutgers)
W79-03439

WATER + WEEDS + HEAT = NOVEL EXPERIMENTATION,
Beak Consultant Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 5G.
W79-03456

USE OF SODIUM THIOSULFATE DECHLORINATED MUNICIPAL WATER IN SALMON CULTURE,
Weyerhauser Co., Springfield, OR.
B. J. Allee, and R. W. Anderson.
In: 26th Annual Northwest Fish Culture Conference, Dec 3-5, 1975, Otter Rock, Oregon, p 18-23, 1 tab, 7 ref.

Descriptors: *Bioassay, *Mortality, *Aquiculture, *Chlorination, De-chlorination, *Sodium thiosulfate, Fish hatchery, Fish physiology, Chemical analysis, Sodium thiosulfate, Saltwater survival, Enzymes, Gill ATP-ase levels, Blood chemistry, Waste treatment.

A bioassay was conducted assessing growth, freshwater survival, blood chemistry, gill-ATP-ase levels, and saltwater survival for coho salmon reared in sodium thiosulfate dechlorinated water and an unchlorinated control. No detrimental effects were observed in fish survival, growth, health, saltwater survival or gill ATP-ase levels when compared to a common source control. (EIS-Katz)
W79-03462

INTERFACING HYDROTHERMAL AND BIOLOGICAL STUDIES IN WASTE HEAT MANAGEMENT,
MacLaren (James F.) Ltd., Willowdale (Ontario).
P. E. Wisner, D. B. Hodgins, and F. E. J. Fry.
Canadian Water Resources Journal, Vol 3, No 3, p 13-32, 1978. 6 fig, 3 tab, 11 ref.

Descriptors: *Thermal pollution, *Cooling water, Heated water, Water temperature, Thermal powerplants, Outlets, Effluents, Water quality standards, Thermal stress, Water pollution sources, Heat resistance, Entrainment, Toxicity, Bioassay, Aquatic populations, Nuclear powerplants, Mathematical models, Engineering, *Thermal effluent.

The selection of a waste heat management alternative for a steam-electric generating station and the level of sophistication of hydrothermal modelling used in the analysis of the alternative can only be efficient if related to three factors. These are: the stage of the study, the available environmental data, and the level of environmental/biological significance of the water body. The main thrust of this paper is to illustrate a simple methodology for effectively combining these various factors. (EIS-Deal)
W79-03463

SIMULATION ANALYSIS OF THE CONCENTRATION PROCESS OF TRACE HEAVY METALS BY AQUATIC ORGANISMS FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
I. Acyama, Yos. Inoue, and Yor. Inoue.
Water Research, Vol 12, p 837-842, 1978. 7 fig, 1 tab, 8 ref.

Descriptors: *Mathematical models, *Simulation analysis, Food chains, Nutrient requirements, Heavy metals, Predation, Trophic level, Computer models, Mathematical studies, Fish food organisms, Food habits, Growth rates, *Bioaccumulation.

This paper proposed the food condition factor which unifies the population density and aggregation index of prey organisms from the viewpoint of the nutrition ecology in the case of modeling the concentration process of heavy metals by aquatic organisms. By using this factor we can generalize the food conditions when experiments on the biological concentration process of trace heavy metals through a food chain are performed. Simulation analysis on the concentration process of metals by a fish was made on the basis of the mathematical model described. (EIS-Deal)
W79-03467

CHROMIC ACID IN ASSIMILATION STUDIES - A CAUTION,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
For primary bibliographic entry see Field 5C.
W79-03468

BIOCONCENTRATION RATIO OF DIAZINON BY FRESHWATER FISH AND SNAIL,
National Inst. of Agricultural Sciences, Tokyo (Japan).
For primary bibliographic entry see Field 5C.

W79-03483

PCB RESIDUES IN MULLET, MUGIL CEPHALUS, FED TO CAPTIVE EASTERN AUSTRALIAN WATER RATS, HYDROMYS CHRYSOGASTER,
Commonwealth Scientific and Industrial Research Organization Lyneham (Australia). Div. of Wildlife Research.
P. Woollard, and H. Settle.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 606-612, 1978. 1 fig, 3 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Mullets, *Pesticide residues, Rodents, Chemical analysis, Aroclors, Chlorinated hydrocarbon pesticides, Path of pollutants, Chromatography, *Australia, Pesticide kinetics, Commercial fishing, Water quality standards, *Tissue analysis, *Australian water rats.

During an investigation into levels or organochlorine pesticides in water rats, Hydromys chrysogaster, from an irrigation area in New South Wales, captive-raised water rats were found to contain polychlorinated biphenyl (PCB) residues. The most likely source of these residues was found to be mullet, Mugil cepha lus, the mahjor item of diet. The results of chromatographic analysis of fish and rat tissues for PCB levels were reported and possible paths of PCBs into fish tissues were suggested. (EIS-Deal)
W79-03484

THE TECHNICAL VARIABILITY IN BIOTIC INDICES,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5A.
W79-03489

5C. Effects Of Pollution

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR,
Tennessee Univ., Knoxville.
S. Neperud.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 643, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, March 1978. 87 p, 9 fig, 19 tab, 20 ref, 3 append. OWRT A-043-TENN(3).

Descriptors: *Storm runoff, Water quality, Urban runoff, Urban watersheds, *Tennessee, *Stormwater, *Water quality standards, Dissolved oxygen, Total solids, *Fort Loudon Reservoir(Tenn), Reservoirs.

The purpose was to determine the effects of stormwater runoff on the water quality of Fort Loudon Reservoir. The experimental data were obtained from samples taken from Fort Loudon Reservoir before, during, and after runoff events as well as from samples taken during dry weather (control conditions). Grab samples were taken at three specific sites at one-hour intervals for the duration of the sampling period. Each sample was immediately analyzed at the Knoxville, Tennessee, Third Creek Wastewater Treatment Plant. Water quality parameters obtained were dissolved oxygen, pH, biochemical oxygen demand, conductivity, temperature, total solids, and fecal coliform bacteria. Twenty-five test runs were made. No significant water quality changes were observed between control values and those obtained after the addition of stormwater runoff into the reservoir, although for the low intensity storm monitored, the values did fluctuate a great deal. Total solids and dissolved oxygen violated stream standards on two occasions.
W79-03005

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN RUBBER PROCESSING OPERATIONS,
Research Triangle Inst., Research Triangle Park, NC. Center for Technology Applications.
For primary bibliographic entry see Field 5B.
W79-03008

CITRIC ACID ENHANCEMENT OF COPPER SULFATE TOXICITY TO THE BLUE-GREEN ALGAE APHANIZOMENON FLOS-AQUAE AND MICROCYSTIS AERUGINOSA,
Missouri Univ.-Kansas City. Dept. of Biology.
Lisa LaVaughan Ray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 637, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, 1978. 83 p, 13 fig, 23 tab, 56 ref, append. OWRT A-099-MO(1). 14-34-0001-7053 and 7054.

Descriptors: *Copper sulfate, Citric acid, Algae, Algicide, *Cyanophyta, Toxicity, Toxicity tests, Aphanizomenon, Microcystis, Water pollution effects.

Copper toxicity tests were carried out using two species of blue-green algae, Aphanizomenon flos-aquae and Microcystis aeruginosa. Copper concentrations of 300 micrograms/liter or higher inhibited the growth of Aphanizomenon. The addition of 600 micrograms Cu++/liter was the minimum copper concentration necessary to inhibit Microcystis growth over a 14-day experimental period. Copper solubility and cupric ion toxicity were enhanced by the addition of citric acid. Citric acid had no adverse effects on the algicidal properties of copper sulfate. A ratio of citric acid at eight times the weight of copper sulfate pentahydrate at a copper concentration of 500 micrograms/liter (8:1 citrate-copper sulfate mixture) was inhibitory to Microcystis growth over a 14-day period, whereas the addition of 500 micrograms Cu++/liter alone was not. The 8:1 mixture had the same effects as the addition of 600 micrograms Cu++/liter. The increased cupric ion toxicity was not due to a pH effect.
W79-03037

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 6G.
W79-03043

EFFECT OF CARBON DIOXIDE ON PIGMENT AND MEMBRANE CONTENT IN SYNECHOCOCCUS LIVIDUS,
Massachusetts Univ., Amherst. Dept. of Microbiology.
L. S. Miller, and S. C. Holt.
Archives of Microbiology, Vol. 115, p 185-198, 1977. 24 fig, 1 tab, 33 ref. OWRT-A-069-MASS, 14-31-0001-4021

Descriptors: *Cyanophyta, *Carbon dioxide, Nutrients, *Electron microscopy, *Pigments, *Synechoccus lividus, *Cyanobacteria, Bleaching-regreening, Chlorophyll, Water pollution effects, Thylakoid membrane, C-phycocyanin, Chlorophyll a.

The effect of carbon dioxide on pigment and membrane content in Synechococcus lividus was studied by depriving cells of CO2 and examing cell populations biochemically and by electron microscopy. After 120 hr of CO2 deprivation, S. lividus lost all detectable chloropyll a and C-phycocyanin. Such bleached cultures were 'mustard yellow', the result of approximately 1.8 times more carotenoid per cell than green control cultures. Although cells from bleached cultures appeared morphologically indentical to control green cells when examined by light microscopy, electron microscopic examination revealed them to be devoid of detectable thylakoid membrane. Thylakoid membrane could not be recovered by physical isolation or revealed by freeze etching of bleached S. lividus. In addition, inclusion bodies characteristically found in s. lividus were also absent. Reintroduction of CO2 into bleached cultures resulted in a rapid resynthesis of both chloropyll a and C-phycocyanin. Electron microscopic examination of these regreening cultures revealed that thylakoid membrane was also rapidly resynthesized. Growth of regreened cultures did not occur until there was the synthesis of a full complement of chlorophylla, C-phycocyanin, and thylakoid membrane. A time course study of the cytological events occurring during bleaching and regreening is presented.
W79-03102

BACTERIAL ECOLOGY OF STRIP MINE AREAS AND ITS RELATIONSHIP TO THE PRODUCTION OF ACIDIC MINE DRAINAGE,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5G.
W79-03104

METHYLOTROPHIC ENZYME DISTRIBUTION IN METHYLOSINUS TRICHOSPORIUM,
Ohio State Univ., Columbus. Dept. of Microbiology.
T. L. Weaver, and P. R. Dugan.
Journal of Bacteriology, Vol. 122, No. 2, p. 433-436, May 1975. 2 fig, 2 tab, 22 ref. OWRT A-027-OHIO(6).

Descriptors: *Enzymes, *Methane, Centrifugation, Distribution, Bacteria, Cytological studies, *Methylosinus trichosporium, *Methylotrophic enzyme, *Methane oxidation, *Methane fixation, Electron transport, Cytochrome, Membrane fractions, Phosphorylation.

Key enzymes involved in the oxidation and fixation of methane by Methylosinus trichosporium were examined for localization within the bacterial cells. A differential centrifugation scheme following cell disruption was used to provide membrane and soluble fractions for the enzyme assays. All the methylotrophic enzymes examined were found to be soluble with the practionation scheme. Electron transport involving a cytochrome C2 with absorption peaks at 416, 522, and 550 nm and oxidative phosphorylation were found in the membrane fractions. Mixed soluble and membrane fractions coupled the oxidation of methanol and formate with cytochrome reduction. (Chao-Ohio).
W79-03105

ULTRASTRUCTURE OF METHYLOSINUS TRICHOSPORIUM AS REVEALED BY FREEZE ETCHING,
Cornell Univ., Ithaca, NY. Lab. of Microbiology.
T. L. Weaver, and P. R. Dugan.
Journal of Bacteriology, Vol. 121, No. 2, p. 704-710, February 1975. 9 fig, 12 ref. OWRT A-027-OHIO(5).

Descriptors: Methane, Membrane, Etching, Bacteria, Cytological studies, *Methylosinus trichosporium, Methane-oxidizing bacteria, *Freeze etching, Cytoplasm.

The methane-oxidizing bacterium Methylosinus trichosporium forms extensive intracytoplasmic membranes that lie near the cell periphery and parallel to it. These membranes enclose cavities within the cytoplasm and exist as flattened, balloon-like vesicles. The internal membranes are passed along to both cells during budding. The bacteria accumulate poly-B-hydroxybutyrate granules that lie in the center of the cells, neither within the internal membrane vesicles nor attached to them. Intercellular bridges result in the formation of chains of bacteria two to four cells in length. (Chao-Ohio).
W79-03106

LOCALIZATION OF CHITIN IN ALGAL AND FUNGAL CELL WALLS BY LIGHT AND ELECTRON MICROSCOPY.

Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.
N. L. Pearlmutter, and C. A. Lembi.
The Journal of Histochemistry and Cytochemistry, Vol. 26, No. 10, April 1978, p 782-791, 3 fig. OWRT B-081-IND (1).

Descriptors: *Algae, *Aquatic fungi, *Chlorophyta, Cytological studies, *Pithophora oedogonia, *Blastocladiella emersonii, *Chitin.

Chitin was visualized in cell walls after hydrolysis with potassium hydroxide and subsequent postfixation of the deacetylated polysaccharide (chitosan) in OsO4. Areas of chitin deposition appeared dark brown by light microscopy and electron dense in the electron microscope. With this method, the presence of chitin was demonstrated in the cell walls of the green alga Pithophora oedogonia (Montagne) Wittrock and two fungi, Ceratocystis ulmi Buism. (C. Moreau) and Blastocladiella emersonii Cantino and Hyatt. Most of the chitin in P. oedogonia was found in the crosswall disk and small amounts occurred in the outer longitudinal walls. The spetal disk of C. ulmi also contained chitin, but significant amounts were present in the inner and outer regions of longitudinal walls as well. Chitin was present throughout the walls of B. emersonii. Small amounts of chitin were not easily demonstrated by this technique, but removal of chitosan by exposure to dilute acetic acid before osmium fixation disrupted cell wall integrity, suggesting that small amounts of the structural polysaccharide had been removed.
W79-03111

PCB AND THE HOUSATONIC RIVER - A REVIEW AND RECOMMENDATIONS,
Connecticut Academy of Science and Engineering, Hartford; and Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W79-03114

DYNAMICS OF POLYCHLORINATED BIPHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT. PHASE 1, TASK 1, COMPILATION OF INFORMATION,
URS Co., Seattle, WA.
R. N. Dexter, S. P. Pavlou, W. G. Hines, and D. A. Anderson.
Fish and Wildlife Service Report, April 1978. 71 p, 2 fig, 1 tab, 154 ref. 14-16-0009-78-026.

Descriptors: *Environmental effects, *Polychlorinated biphenyls, Model studies, *Mississippi River, Sediment transport, *Translocation, *Distribution, Aquatic habitats, Aquatic insects, Aquatic plants, Plankton, Benthos, Hydrology, Sediments, Water quality, Lakes, Wetlands, Rivers, Movement, Sediment transport, Path of pollutants, Bioaccumulation, Chemical partitioning, *Lake Onalaska, *Diagnostic models, *Literature surveys.

A program was undertaken by the Columbia National Fishery Research Laboratory to investigate the distribution and impact of polychlorinated biphenyls (PCB's) in the Upper Mississippi River in the vicinity of Lake Onalaska. The goal of the program is to develop a diagnostic model to show the extent of PCB contamination in the ecosystem, to identify potential factors for controlling PCBs in this area, and, most importantly, provide a capability for predicting other contaminant crises prior to occurrence. The first task, which is reported here, was to identify published and unpublished sources of information and on-going studies related to the study. The report includes an outline of the overall study, an annotated bibliography of related information, and a list of persons contacted with types of information they have available. An evaluation of the information is presented in the report subtitled, 'Task 2: Evaluation of Compiled Information'. (See W79-03119) (Little-FWS)
W79-03118

DYNAMICS OF POLYCHLORINATED BIPHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT PHASE 1, TASK 2: EVALUATION OF COMPILED INFORMATION,
URS Co., Seattle, WA.
R. N. Dexter, W. G. Hines, E. Quinlan, and S. P. Pavlou.
Fish and Wildlife Service Report, July 1978. 87 p, 20 fig, 4 tab, 26 ref, 1 append.

Descriptors: *Polychlorinated biphenyls, Model studies, *Mississippi River, Rivers, Lake Onalaska, Lakes, *Hydrology, Sediment transport, Flow rates, Electrical conductance, Distribution, Path of pollutants, Winds, Fish, Water circulation, Sedimentation, Water quality, Plankton, Runoff, *Environmental effects, Aquatic habitats, Aquatic animals, *Diagnostic models, *Literature reviews, Sources, Bioaccumulation, Chemical partitioning.

A program was undertaken by the Columbia National Fishery Research Laboratory to investigate the distribution and impact of polychlorinated biphenyls (PCB's) in the Upper Mississippi River in the vicinity of Lake Onalaska. The goal is to develop a diagnostic model to show the extent of PCB contamination in the ecosystem, identify potential factors for controlling PCB's in the area, and provide a capability for predicting other contaminant crises prior to occurrence. Part of the initial phase of developing the model was to evaluate the applicability of existing information identified in 'Task 1: Compilation of Information'. (See W79-03118) The analysis reported here describes the study area and considers the physical characteristics (hydrology and sedimentation) of the system and the distribution and movement of PCB's. Important observations were made regarding flow rates in the main river channel and Lake Onalaska; sediment type and movement; and PCB sources, distribution and transport. Subject areas where information is lacking were also noted. (Little-FWS)
W79-03119

ENVIRONMENTAL PREFERENCES OF SELECTED FRESHWATER BENTHIC MACROINVERTEBRATES,
Massachusetts Dept. of Environmental Quality Engineering, Westborough. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5A.
W79-03128

CHANGES IN ZOOPLANKTON POPULATIONS IN THE WHITE VOLTA WITH PARTICULAR REFERENCE TO THE EFFECT OF ABATE,
Ghana Inst. of Aquatic Biology, Achimota.
J. Samman, and J. P. Thomas.
International Journal of Environmental Studies, Vol. 12, No. 3, 1978, p 207-214. 7 fig, 7 ref.

Descriptors: *Abate, *Water pollution effects, *Insecticides, *Zooplankton, *Thermocyclops hyalinus, *Lethal limit, *White Volta River, *Toxicity, *Reservoirs, *River basins, *Ghana, Volta River Basin, Simulium damnosum, Onchocerciasis, Public health, Human diseases, Copepods, Larvicides, Pesticides, Vertical migration, Diel migration, Crustaceans, Cladocera, Spraying, Rivers.

Laboratory tests for toxicity determined the 24-hr LC50 of the nauplii of Thermocyclops hyalinus using the insecticide Abate CE 200 (used to destroy Simulium damnosum for onchocerciasis control in the Volta River Basin) at 0.23 ppm. The 24-hr LC50 of the copepodite and adult stages of T. hyalinus, the dominant zooplankter in the basin, was 0.2 ppm. Pre- and post-sunset drift samples were also collected at the outflow of the reservoir created at Daboya, Ghana, where the White Volta empties into Volta Lake, December 1975-September 1976 before and after weekly aerial spraying with Abate was begun January 1976. Though the concentration of Abate introduced into the reservoir was much higher than the 24-hr LC50 of T. hyalinus, the microcrustacean population appeared tto be unaffected, probably because: (1) microcrustacea drifting into the reservoir from upstream sustained reservoir populations, (2) zooplankton living at the banks of the reservoir escaped effects of Abate flowing downstream, and (3) the spraying was done around mid-day when the majority of the zooplankton population had migrated to the bottom. Numbers of drifting zooplanktonic microcrustacea in the White Volta increased March-July (dry season), and there was normally an increase in numbers of microcrustacea in night samples, probably related to the vertical migration of the zooplankton in the reservoir upstream. Drift samples contained Copepoda, Cladocera, and Chaoboridae. (Lynch-Wisconsin)
W79-03173

EFFECT OF AN ORGANOPHOSPHORUS INSECTICIDE, ABATE, USED IN THE CONTROL OF SIMULIUM DAMNOSUM ON NONTARGET BENTHIC FAUNA,
Ghana Inst. of Aquatic Biology, Achimota.
J. Samman, and M. P. Thomas.
International Journal of Environmental Studies, Vol. 12, No. 2, 1978, p 141-144. 1 fig, 2 tab, 10 ref.

Descriptors: *Abate, *Insecticides, *Organophosphorus pesticides, *Simulium damnsoum, *Benthic fauna, *Oti River(West Africa), *Onchocerciasis, *Human diseases, *Public health, *Toxicity, *Ghana, Invertebrates, Insects, Water pollution effects, Pollutants, Pesticides, Rivers, Baetidae, Leptophlebiidae, Larvicides, Spraying, Volta River Basin, River basins.

Effects of Abate, an organophosphorus insecticide, on nontarget benthic fauna were investigated in the River Oti in northern Ghana. Two of three predominating organisms, Baetidae and Leptophlebiidae, were seriously affected by the larvicide; other nontarget organisms killed included Gomphidae, Libellulidae, and Dytiscidae. Abate toxicity was relatively insignificant to other taxa, particularly Neoplerla sp and Orthocladinae. Abate is used in the Volta River Basin in the Onchocerciasis Control Program to destroy the disease-carrying organism Simulium damnosum. Previous studies of the effect of Abate on nontarget organisms have produced inconsistent results. In this study Abate CE 200 was sprayed from the air on the river near its point of entry into Volta Lake. A surber sampler was used to collect predosing samples on 22 March 1977 from 2:00-5:00 pm at two sites, one covered by flat-surfaced rock (Site R) and one made up of gravels (Site G). The insecticide was sprayed from 400 m at 9 am on 23 March 1977, and postdosing samples were collected 2-4 pm the same day. Dosage at the sampling site was estimated at 0.01-0.05 ppm for about 30 min. More taxa and numbers were collected from Site G than from Site R. The presence of several taxa only at the former site indicates a lack of uniformity in distribution of benthic invertebrates in the riverbed. (Lynch-Wisconsin)
W79-03174

EFFECTS OF CHROMIUM ON SOME AQUATIC PLANTS,
Environmental Assessment Council, Inc., New Brunswick, NJ.
J. Mangi, K. Schmidt, J. Pankow, L. Gaines, and P. Turner.
Environmental Pollution, Vol. 16, No. 4, p 285-291, August 1978. 4 fig, 8 ref.

Descriptors: *Chromium, *Water polluton effects, *Algae, *Duckweed, *Toxicity, *Susquehanna River, *Bioaccumulation, New York, Plant growth, Absorption, Pollutants, Aquatic plants, Rivers, Ecosystems, Lemna minor, Chlorophyta, Spirodela polyrrhiza, Palmella mucosa, Oedogonium, Hydrodictyon reticulatum, Palmellococcus protothecoides.

Chromium, as Cr(VI), Cr04(=), was moderately toxic to four riverine chlorophyte algal species, and less so to two duckweed species (Lemna minor and Spirodela polyrrhiza). Samples collected primarily in the upper Susquehanna River in New York at the Pennsylvania border were supplemented by algal samples from the Tioughnioga and Chenango rivers. Algal species included Palmella mucosa, Oedogonium sp, Hydrodictyon reticulatum, and Palmellococcus protothecoides. Accumu-

lation of chromium by living and dead plant tissue was extensive and could have important effects on the river ecosystem. Growth of all plants was inhibited by 10 ppm chromium. Unicellular algae (Palmella and Palmellococcus) declined in cell numbers after two weeks, while the filamentous forms (Oedogonium and Hydrodictyon) showed weight loss. Both duckweed species grew during the two weeks, but less so than in controls. Among algae, a percentage of healthy looking cells and filaments remained amid the bleached, distorted ones. Effects of lower chromium doses were mixed, though uptake was approximately linearly correlated with background concentration. Since chromium was taken up by dead cells, absorption appears largely responsible for uptake; much of the chromium was localized on cell walls. Under laboratory conditions enough chromium is absorbed to detoxify the medium, which appears to allow some cells to survive and reestablish the population. Outermost cells may remove enough chromium to protect inner cells. (Lynch-Wisconsin)
W79-03176

CHANGES IN THE AQUATIC MACROPHYTE FLORA OF WHITEWATER LAKE NEAR SUDBURY, ONTARIO FROM 1947 TO 1977,
Guelph Univ., (Ontario). Dept. of Botany and Genetics.
H. M. Dale, and G. E. Miller.
The Canadian Field-Naturalist, Vol. 92, No. 3, p 264-270, July-September 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Macrophytes, *Whitewater Lake(Ontario Canada), *Water pollution effects, *Bioindicators, *Urban runoff, *Mine wastes, *Municipal wastes, Industrial wastes, Storm drains, Lakes, Ontario(Canada), Canada, Abundance, Water crowfoot, Ranunculus trichophyllus, Myriophyllum exalbescens, Potamogeton amplifolius, Potamogeton gramineus, Potamogeton natans, Potamogeton praelongus, Floating heart, Nymphoides cordatum, Water marigold, Megalodonta beckii, Heteranthera dubia, Pontederia cordata.

Comparison of a June-July 1977 survey of macrophytes in Whitewater Lake, near Sudbury, Ontario, Canada, with a survey conducted by Soper in 1947 before the lake was enriched and disturbed by recent release of municipal and industrial effluents shows that several species have decreased in abundance, five are now extinct, and only two have increased significantly. Of four new species recorded, two were rare and two were probably misidentified in 1947. Species now apparently extinct are wild rice (Zizania aquatica), lesser duckweed (Lemna minor), and Potamogeton foliosus, all rare in 1947, and floating heart (Nymphoides cordatum) and water marigold (Megalodonta beckii), both abundant in 1947. Species abundant in 1977 but rare or occasional in the earlier survey are water star grass (Heteranthera dubia) and pickerel weed (Pontederia cordata). The increase in water star grass appears due to its greater tolerance combined with reduced competition from other species. Six species can be classed as indicators based on their adverse reaction to the waste effluents: water crowfoot (Ranunculus trichophyllus), North American water milfoil (Myriophyllum exalbescens), and four pondweeds (Potamogeton amplifolius, P. gramineus, P. natans, and P. praelongus). Storm drains from the village of Azilda discharge into the lake, which also receives indirect drainage high in copper, nickel, and iron (and with a pH of 7.8) from a mining operation tailings dump. (Lynch-Wisconsin)
W79-03177

ECOLOGICAL STUDIES ON INDONESIAN LAKES, THE MONTANE LAKES OF BALI,
Cambridge Univ. (England). Dept. of Biology.
J. Green, S. A. Corbet, E. Watts, and O. B. Lan.
Journal of Zoology, Vol. 186, No. 1, September 1978, p 15-38. 6 fig, 7 tab, 19 ref.

Descriptors: *Bali(Indonesia), *Eutrophication, *Danau Bratan(Indonesia), *Danau Batur(Indonesia), *Danau Buyan(Indonesia), *Danau Tamblingan(Indonesia), *Mountain lakes, Limnology, Phytoplankton, Zooplankton, Water chemistry, Indonesia, Islands, Lakes, Mountains, Ecology, Guppies, Poecilia reticulata, Aquatic plants, Fisheries, Urbanization, Water pollution effects, Conductivity, Hydrogen ion concentration, Biological communities, Invertebrates, Alpine.

our Balinese Mountain lakes were surveyed 15-25 August 1974, two of which (Danau Bratan at 1231 m and Danau Batur at 1031 m) were studied in 1929 by the German Sunda Expendition. While Danau Batur, larger than Danau Bratan (15.9 vs 3.8 sq km) and with very high conductivity (1650 micromho/cm at 20 C), showed little change since 1929, unproductive Danau Bratan, with very low conductivity (39 micromho/cm), showed changes in water chemistry and plankton composition which may reflect slight cultural eutrophication. The previously unstudied lakes, Danau Buyan and Danau Tamblingan (both at 1214 m), lie in the same caldera as Danau Bratan; water quality of all three lakes appears similar to 1929. If so, Danau Tamblingan has hardly changed, Danau Buyan has changed little, and Danau Bratan has changed much more. The latter has been subjected to the heaviest human pressure, followed by Danau Buyan and inaccessible Danau Tamblingan; Danau Batur is being developed as a tourist center. The three adjacent lakes are contrasted in terms of stability of stratification, plankton composition, vegetation, marginal fauna, guppy diet, and fisheries, and differences are related to wind exposure and effects of human settlement. Changes in Danau Bratan since 1929 include; (1) doubling of conductivity from 18 to 39 micromho/cm, (2) a pH change from 6.8 to 7.1, (3) end of desmid dominance of phytoplankton, and (4) marked zooplankton species composition changes. (Lynch-Wisconsin)
W79-03180

ON NUTRIENTS AND THEIR ROLE AS PRODUCTION LIMITING FACTORS IN THE BALTIC,
Fishery Board of Sweden, Goteborg. Inst. of Marine Research.
S. H. Fonselius.
Acta Hydrochimica et Hydrobiologica, Vol. 6, No. 4, 1978, p 329-339. 10 fig, 8 ref.

Descriptors: *Baltic Sea, *Nutrients, *Limiting factors, *Eutrophication, *Primary productivity, *Organic matter, Seas, Phytoplankton, Deep water, Halocline, Algae, Phosphorus, Nitrogen, Ammonia, Phosphates, Hydrogen sulfide, Trophic level, Water pollution effects, Sewage treatment, Oxygen depletion, Anaerobic conditions, Aerobic conditions.

The reason for increasing eutrophication in the Baltic Sea may be alternating oxic and anoxic conditions, and phosphate may be the most limiting factor for phytoplankton production. Nitrogen is always available, for example as ammonia. The Baltic is a semienclosed basin with a positive water balance; oxygen in deep water becomes depleted and nutrients accumulate. Deep water oxygen conditions are regulated by the water exchange ratio in the Danish sounds, in the supply of organic matter, and the oxidation rate. Organic matter is brought in by river water, inflowing bottom water from the Kattegatt, precipitation, and effluents, and is produced by the sea itself through biological processes. Biological production is regulated by sunlight, light penetration, temperature, supply of nutrient salts, vitamins, hormones, trace metals, and other factors. A previous study showed only 10% of annual organic matter supply in the sea would produce anoxic conditions in deep water below the halocline. The Baltic has very low surface water nutrient levels but large concentrations in deep water. Hydrogen sulfide is formed and phosphate is dissolved from sediments during anoxic periods, and with return of oxic conditions sediment phosphorus is again renewed through precipitation of iron phosphate. With inflow of new water to deep areas, accumulated nutrients are washed to the surface through thermohaline convection, causing surface fertilization. (Lynch-Wisconsin)
W79-03182

ASSESSING CHANGES IN BIOMASS OF RIVERBED PERIPHYTON,
Guelph Univ. (Ontario). Dept. of Zoology.
W. K. Liaw, and H. R. MacCrimmon.
Internationale Revue der Gesamten Hydrobiologie, Vol. 63, No. 2, 1978, p 155-171. 4 fig, 14 tab, 19 ref.

Descriptors: *Periphyton, Rivers, *Grand River(Ontario Canada), *Benthic flora, *Artificial substrates, *Methdology, River beds, Algae, Biomass, Riffles, Ontario(Canada), Canada, Organic matter, Primary productivity, Substrates, Suspended solids, Speed River(Ontario Canada), Scour, Respiration, Grazing, Chlorophyll, Detritus, Invertebrates.

Measurement of losses and gains of periphyton in a downriver riffle of the Grand River, a large river in Ontario, Canada, using concrete blocks and attached glass slides as substrates, showed that periphyton is a significant source of suspended organic matter in rivers of relatively unwooded basins. Concrete blocks were better as a substrate than glass slides; periphyton was well-established on the blocks toward the end of the study period (May-December 1971), similar to that on native rocks in terms of biomass, carbon and nitrogen content, and ratio of biomass to chlorophyll-a. Average accumulation rate of periphyton on glass slides (which were replaced monthly) was 266.2 mg/sq m/day ash-free wt, 120.9 carbon, 20.4 nitrogen, and 1.11 chlorophyll-1. On concrete blocks average accumulation rate was 590.0 mg/sq m/day ash-free wt, 202.9 carbon, 22.8 nitrogen, and 2.95 chlorophyll-a. Standing biomass of periphyton on glass slides varied from 0.7 g/sq m in December to 21.6 g/sq m May-June, with an average of 8.6 g/sq m. On concrete blocks biomass ranged from 29.9 g/sq m in October to 132.5 g/sq m in August, with a mean of 66.1 g/sq m. Comparison of biomass of periphyton on slides and on concrete blocks provided an estimated of the average rate of loss (from scour, respiration, and grazing) of periphyton from concrete blocks at 2.9 g/sq m/day, which is 63% of the mean total accumulation rate of the periphyton. (Lynch-Wisconsin)
W79-03183

SOME FACTORS AFFECTING ON DRY WEIGHT, ORGANIC WEIGHT AND CONCENTRATIONS OF CARBON AND NITROGEN IN FRESHLY PREPARED AND IN PRESERVED ZOOPLANKTON,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W79-03184

DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON IN 153 LAKES, RIVERS, AND POOLS IN THE NORTHWEST TERRITORIES,
Canada Environmental Protection Service, Yellowknife (Northwest Territories).
J. W. Moore.
Canadian Journal of Botany, Vol. 56, No. 15, August 1978, p 1765-1773. 2 fig, 2 tab, 47 ref.

Descriptors: *Lakes, *Rivers, *Temporary pond stage, *Phytoplankton, *Northwest Territories(Canada), *Basic data collections, *Distribution, *Abundance, *Arctic, *Cold regions, Algae, Ponds, Canada, Dinobryon bavaricum, Dinobryon cylindricum, Dinobryon sociale, Dinobryon divergens, Cyclotella glomerata, Cyclotella ocellata, Diatoms, Great Slave Lake(Northwest Territories Canada), Great Bear Lake(Northwest Territories Canada), Mackenzie River(Northwest Territories Canada).

Phytoplankton were surveyed 1975-77 in 153 lakes, rivers, and temporary pools in Canada's Northwest Territories, an area lying above a latitude of about 55 degrees and comprising the largest expanse of freshwater in the world. Dinobryon bavaricum was the most abundant and widespread species, occurring in almost all collections, followed by D. cylindricu, D. sociale, and D. divergens. Predominant diatoms were Cyclotella glomerata nd C. ocellata, both of which reached greatest abundance in lakes and rivers of the high arctic and were

completely absent from temporary pools (a distribution almost certainly related to turbulence). Although Asterionella formosa, Diatoma tenue var. elongatum, and Melosira islandica were common in Great Slave Lake and other southern lakes, they were rare or absent north of latitude 65 degrees. Chlorophyta (particularly Ankistrodesmus falcatus and Scenedesmus spp.) occurred in almost all collections but always in low numbers. Planktonic Cyanophyta, primarily Oscillatoria limnetica, were normally rare. Most samples were collected in the western arctic and subarctic, with additional collections in the arctic archipelago as far north as Ellesmere Island. Collections were usually made at 5-m depth intervals to maximum depth. The predominance of Dinobryon spp. parallels phytoplankton records of Alaska, Scandinavia, and the Quebec-Labrador Peninsula. Densities of dominant algae in this study were considerably lower than in northern and alpine Europe, central Canada, and Alaska. (Lynch-Wisconsin)
W79-03185

ORGANIC CARBON-A NONSPECIFIC WATER QUALITY INDICATOR FOR LAKE SUPERIOR,
Minnesota Univ., Minneapolis. Dept. of Civil Mineral Engineering.
For primary bibliographic entry see Field 5A.
W79-03186

A METHOD FOR THE ANALYSIS OF ENVIRONMENTAL FACTORS CONTROLLING PATTERNS OF SPECIES COMPOSITION IN AQUATIC COMMUNITIES,
Manitoba Univ., Winnepeg. Dept. of Zoology.
R. H. Green, and G. L. Vascotto.
Water Research, Vol. 12, No. 8, 1978, p 583 590. 3 fig, 3 tab, 61 ref.

Descriptors: *Methodology, *Analytical techniques, *Species composition, *Cluster analysis, *Classification, *Lakes, *Zooplankton, Ontario(Canada), Canada, Environmental effect, Parameters, Water chemistry, Statistical models, Model studies, Computer models, Pollutants, Water pollution effects, Species diversity, Diversity indices.

Analytical methods for determining effects of environmental parameters on biological species composition are analyzed: (1) methods which reduce biological data, such as species abundance, to a more usable form (including ordination and classification methods, and diversity indices); and (2) methods which relate these reduced data to environmental data. The procedure recommended is classification (or cluster) analysis of biological data, followed by multiple discriminant analysis of species assemblage groups on the environmental variables. An example illustrating the procedure is given, applications of these methods to pollution studies is discussed, and possible modifications and extensions are considered. The example utilizes data from Patalas (1971) on abundance of 27 zooplankton species in 34 lakes in northwestern Ontario, Canada. Values for 11 morphometric and chemical variables in each lake were obtained from two published sources; variables included area, maximum depth, conductivity, total dissolved solids, calcium, magnesium, sodium, potassium, iron, nitrogen, and phosphorus. Results may show a pollution species assemblage whose samples are located only in the impact part of the study area and are separated from other species assemblage groups by a discriminant function with high coefficients only on the pollutant variables. (Lynch-Wisconsin)
W79-03187

ECOLOGICAL GENETICS OF TROUT ADAPTED TO GEOTHERMALLY HEATED WATERS OF YELLOWSTONE PARK,
Montana State Univ., Bozeman. Dept. of Biology.
D. G. Cameron, E. R. Vyse, and D. Browne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 766, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Montana State University, Research Report Number 97. October 1978. 31 p. OWRT A-107-MONT(1), 14-34-0001-8028.

Descriptors: Fish environment, *Water temperature, *Fish genetics, *Enzymes, Fish behavior, Environmental effects, Proteins, Montana, Wyoming, *Thermal water, *Rainbow trout, Firehole River(Mont), *Yellowstone Park, Isozymes, Alleles, Heterozygosity, Reproduction.

The electrophoretic mobility of proteins extracted from tissues of rainbow trout inhabiting highly atypical thermal regimes with water temperatures reaching 29.5 degrees C was measured. Measured levels of heterozygosity (H) and allelic homologies in these fish were not significantly different from those found in cold water and hatchery rainbow trout of South Central Montana. As no unique alleles could be inferred from the products of the 6 polymorphic loci in the fish of the warmer waters, no genetic adaptation was apparent. Concurrent laboratory work failed to indicate any unusual heat tolerance, and the lack of apparent evolutionary change suggests these fish survive at the physiological limits of their heat tolerance. (Hunt-Montana)
W79-03307

MICROBIAL SULFUR CYCLE ACTIVITY AT A WESTERN COAL STRIP MINE,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-03308

ENVIRONMENTAL ASPECTS OF A WELL BLOWOUT IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
J. M. Brooks, B. B. Bernard, T. C. Sauer, Jr, and H. Abdel-Reheim.
Environmental Science and Technology, Vol 12, No 6, p 695-703, June 1978. 11 fig, 4 tab, 18 ref.

Descriptors: *Environmental effects, *Gases, *Water pollution, *Blowouts, Sediments, *Gulf of Mexico, Resources development, *Outer Continental Shelf, *Natural seeps, Hydrocarbons.

Studies were conducted around a well blowout site on the Texas continental shelf that resulted in the escape of large quantities of gas and creation of a crater 95 m deep and 500 m wide. Four months after the blowout a plume of suspended sediment and gas continued to emanate from the crater at a seep rate of 10 x 10,000,000 L/day. At this time molecular and isotopic analyses of the seeping gas indicated that the gas was principally of biogenic origin (predominantly methane and delta 13C of -60o/oo) and not accompanied by any brine seepage. The seep gas did, however, contain a small thermocatalytic component as evidenced by the Cl/(C2+C3) ratio and its liquid hydrocarbon content (1.23 mg/L). Measurements of gaseous and liquid hydrocarbons dissolved in the water in the vicinity of the seep indicated rapid dilution of the high concentrations observed over the plume. The depth to which sediments were redeposited around the crater was determined by carbon isotope measurements on the carbonate fraction of the sediment. Analysis of hydrocarbons in redeposited sediments indicated that the original blowout gas was of predominantly thermocatalytic origin, containing higher concentrations of C2-C14 hydrocarbons than are presently seeping from the blowout. The impact of the blowout on temperature, salinity, dissolved oxygen, DOC, POC, TSM, helium, CO2, SigmaCO2, and sulfate in the waters and sediment near the crater is also discussed. (Sinha-OEIS)
W79-03362

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
D. G. Shaw, and B. A. Baker.
Environmental Science and Technology, Vol 12, No 10, p 1200-1205, October 1978. 1 fig, 5 tab, 19 ref.

Descriptors: *Alaska, *Biota, *Sediments, *Oil pollution, Resources development, Water pollution, Baseline studies, Environmental effects, Outer Continental Shelf, Hydrocarbons, Natural seepages, *Port Valdez(AK).

Saturated and unsaturated hydrocarbons were quantitatively determined in biota, water and sediments of Port Valdez, Alaska. These analyses show kinds and amounts of hydrocarbons typical of unpolluted nearshore marine environments. Common, prominent compounds include pristane, heptadecane, odd chain length normal alkanes with 21-31 carbon atoms, and a triterpene tentatively identified as squalene. Environmental samples for this work were collected during the period of approximately one year prior to the completion of the trans-Alaska oil pipeline. The operation of a tanker loading facility associated with that pipeline at Valdez will result in a controlled input of petroleum into Port Valdez. The results presented here provide a basis from which to investigate the fate of that added oil. (Sinha-OEIS)
W79-03366

ACCUMULATION OF SATURATED HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATYRHYNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.
G. C. Lawler, W. Loong, and J. L. Laseter.
Environmental Science & Technology, Vol. 12, No. 1, p. 47-54, January 1979. 3 fig, 1 tab, 20 ref.

Descriptors: *Oil pollution, *Pollution effects, *Ducks(Wild), *Labortory tests, Resources development, Water pollution, Environmental effects, Hydrocarbons, Anas platyrhynchos.

Mallard drakes were dosed with 5 mL a day of South Louisiana crude oil for 14 days. Tissues from control and experimental ducks were then examined for petroleum hydrocarbons by combined high-resolution gas chromatography and mass spectrometry. Three characteristics of the saturated hydrocarbon fraction were used to assess the presence of crude oil: the n-alkane distribution pattern, the presence of homologous series of petroleum-derived hydrocarbons, and the n-C17/pristane ratio. Oil was found in every experimental tissue examined but the brain. The skin (and underlying adipose tissue) contained the highest level of saturated petroleum hydrocarbons. The other tissues were ranked related to the skin as follows: skin goes to uropygial gland goes to breast muscle, goes to heart muscle goes to liver goes to brain. The blood contained low levels of petroleum-derived hydrocarbons 3-4 hr after the final dose of crude oil. That saturated petroleum hydrocarbons did not accumulate in the duck tissues in the same relative amounts observed in South Louisiana crude oil suggested selective uptake and/or metabolism. (Sinha-OEIS)
W79-03367

DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) IN ESTUARINE ECOSYSTEMS. TESTING THE CONCEPT OF EQUILIBRIUM PARTITIONING IN THE MARINE ENVIRONMENT,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5B.
W79-03369

LIGHT HYDROCARBONS IN RECENT TEXAS CONTINENTAL SHELF AND SLOPE SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-03371

TMP (THERMOMECHANICAL PULPING) EFFLUENTS -- A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, D. Breck, and J. Costantino.

Tappi, Vol. 61, No. 8, p. 19-22, August, 1978. 3 fig, 14 ref, 3 tab.

Descriptors: *Pulp wastes, *Toxicity, *Biochemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Pine trees, Fir trees, Spruce trees(Picea), *Thermomechanical pulping.

The state-of-the-art of thermomechanical pulping (TMP) effluents is summarized as follows: The toxicity of TMP effluents is species-dependent; pine effluent is more toxic than spruce or fir effluent and softwood effluent is more toxic than hardwood effluent. For a given wood species and age of wood since felling, effluent toxicity is not affected by TMP conditions. Unlike toxicity, the BOD of TMP effluents is not dependent on species. BOD loading is slightly more dependent on TMP conditions than toxicity. High steam pressure will give a higher BOD loading and a lower pulp yield. For a given species, the toxicities and BOD loadings of TMP and stone groundwood effluents are comparable. Most of the toxicity and BOD appear to be released in the first stage of a 2-stage TMP system. The chip washing operation, plug screw feeder effluent, and pulp cyclone condensate contribute insignificant loadings of toxicity and BOD to the total TMP effluent. (Swichtenberg-IPC)
W79-03414

LAKE QUALITY DISCRIMINANT ANALYSIS,
Michigan State Univ., East Lansing. Dept. of Resource Development.
K. Reckhow.
Water Resources Bulletin, Vol. 14, No. 4, p 856-867, August 1978. 3 fig, 2 tab, 13 ref.

Descriptors: *Water quality control, *Lakes, *Eutrophication, *Discriminant analysis, *Phosphorus, Dissolved oxygen, Equations, Oxic-anoxic transition point, Estimating, Probability, Prediction, Model studies, Systems analysis.

Despite the fact that lake phosphorus loading criteria have proven to be valuable tools in lake management, they are generally subjective in nature or incomplete in form. In order to address these shortcomings, the oxic-anoxic transition point was selected as an objective quality criterion and discriminant analysis was used to construct a lake classification junction. This function is dependent upon lake phosphorus loading, mean depth, and overflow rate. The value of the function may be expressed as a probability of classification (as either oxic or anoxic). When used in prediction, inclusion of the input error permits the estimation of the change in classification probability as input uncertainty is reduced. Further, the form of the discriminant function suggests that the annual volumetric loading is a more informative term for the expression of phosphorus loading than is the annual areal loading. (Bell-Cornell)
W79-03422

EMISSION OF MICROBIAL AEROSOLS FROM POLLUTED WATERS IN DENSELY POPULATED REGIONS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W79-03438

A STUDY OF NITRIFICATION IN THE DELAWARE RIVER ESTUARY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-03439

EFFECTS OF ARSENATE ON GROWTH AND PHOSPHORUS METABOLISM OF PHYTOPLANKTON,
Fisheries and Marine Service, Winnipeg (Manitoba).
D. Planas, and F. P. Healey.
Journal of Phycology, Vol. 14, p 337-341, 1978. 2 fig, 2 tab, 30 ref.

Descriptors: *Arsenic compounds, *Metabolism, *Phytoplankton, *Toxicity, *Growth rates, Phosphorus, Cytological studies, Aquatic algae, Ochromonas, Chlamydomonas, Anabaena, Mortality, Biochemistry, Absorption, Phosphates, Photosynthesis, Respiration, *Arsenate, Melosira, Cryptomonas.

The response to arsenate in growth and phosphate uptake by five algae in culture varied considerably. The growth rates of Melosira granulata and Ochromonas vallesiaca were depressed by 1 microM arsenate. Chlamydomonas reinhardtii required 10 microM for the same degree of depression, while the growth rates of Cryptomonas erosa and Anabaena variabilis were unaffected up to 100 microM. However, following depletion of phosphate, cultures of the latter two algae began to die at the higher concentration of arsenate tested. Growth of C. reinhardtii in the presence of 35 microM arsenate resulted in characteristics of P deficiency. Comparison of rates of photosynthesis, respiration, and phosphate uptake between cultures of C. reinhardtii which had grown in the presence and absence of arsenate showed little evidence after 16 doublings that it had adapted to arsenate. (EIS-Deal)
W79-03443

COEXISTENCE OF TOXIC AND NONTOXIC DINOFLAGELLATES RESEMBLING GONYAULAX TAMARENSIS IN NEW ENGLAND COASTAL WATERS (NW ATLANTIC),
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
C. M. Yentsch, B. Dale, and J. W. Hurst.
Journal of Phycology, Vol. 14, p 330-332, 1978. 1 fig, 1 tab, 9 ref.

Descriptors: *Algal toxins, *Red Tide, *Dinoflagellates, Toxicity, Aquatic populations, Shellfish, Bottom sediments, Growth stages, Systematics, Classification, Plankton, Biochemistry, Bioassay, Chemical analysis, New England, Gonyaulax.

Two forms resembling Gonyaulax tamarensis coexist in Maine coast plankton; one is toxic, the other is nontoxic. At times, red patches of dinoflagellates were identified as G. tamarensis, yet only presumed to be toxic. These two forms are not easily distinguished by conventional microscopic observations, nor by pigment analysis. Preliminary observations suggest that the nontoxic form is smaler than G. excavata and lacks the 'excavated' ventral region. Characteristic G. excavata resting cysts were found in sediments from the shellfish toxic area off Newagen and Monhagen (Maine) and were not found in sediments from areas where the nontoxic form bloomed. There appear to be a minimum of two G. tamarensis-like organisms. Full systematic treatment of these must await further information. (EIS-Deal)
W79-03444

CALCIFICATION AND CATION SORPTION OF CLADOPHORA GLOMERATA (CHLOROPHYTA),
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
C. S. Sikes.
Journal of Phycology, Vol. 14, p. 325-329, 1978. 2 fig, 1 tab, 53 ref.

Descriptors: Chlorophyta, *Calcium, *Absorption, *Metabolism, *Cladophora, *Cation adsorption, Calcium carbonate, Carbon dioxide, Photosynthesis, Enzymes, Biochemistry, Membrane processes, Cations, Bicarbonates, Chemical reactions, Growth rates, Aquatic algae, Strontium, Radioactivity techniques, Pectin.

Calcium sorption by Cladophora glomerata grown in continuous-flow culture increased substantially as the alga aged. This reflected increased pectin layered in thickening cell walls followed by deposition of $CaCO_3$ around cells. The high levels of pectin may account for the plant's reported high affinity for cations. The onset of carbonate deposition coincided with the appearance of carbonic anhydrase activity in cells. This suggests that carbonate deposition may be a function of bicarbonate use as a source of CO_2 for photosynthesis. Calcium uptake appears to occur by active transport in that it exhibited saturation kinetics, occurred against a concentration gradient, depended on light, and was nearly abolished by treatments that allow diffusion. Although strontium competed for Ca for binding sites of pectin, it did not inhibit internal transport of Ca. Consequently, the proposed carrier may be specific for Ca. (EIS-Deal)
W79-03445

TOXICITY OF BISULFITE TO PROTOSYNTHESIS AND RESPIRATION,
Montana Univ., Missoula. Dept. of Biology.
R. P. Sheridan.
Journal of Phycology, Vol 14, p 279-281, 1978. 5 fig, 12 ref.

Descriptors: *Toxicity, *Photosynthesis, *Respiration, Inhibitors, Sulfur compounds, Growth rates, Water pollution effects, Air pollution effects, Metabolism, Aquatic algae, Phytoplankton, Industrial wastes, *Bisulfite, *Sulfur dioxide, Chlorococcum.

Inhibition of photosynthesis in Chlorococcum sp. by bisulfite ion was the reciprocal of the light intensity curve. Respiration was least affected by bisulfite after endogenous substrate was reduced by incubation in darkness. Maximum reduction in growth occurred with bisulfite treatment at or above optimal growth temperatures. Maximum phytotoxicity correlated with conditions resulting in maximum metabolic activity. (EIS-Deal)
W79-03446

TOXICITY IN RESTING CYSTS OF THE RED-TIDE DINOFLAGELLATE GONYAULAX EXCAVATA FROM DEEPER WATER COASTAL SEDIMENTS,
Oslo Univ. (Norway). Dept. of Marine Biology and Limnology.
B. Dale, C. M. Yentsch, and J. W. Hurst.
Science, Vol. 201, p. 1223-1225, 1978. 2 fig, 8 ref.

Descriptors: *Red tide, *Algal toxins, *Dinoflagellates, *Toxicity, *Bottom sediments, Growth stages, Commercial shellfish, Eutrophication, Human pathology, Animal pathology, Mortality, Algal poisoning, Food chains, Dredging, Gonyaulax, Saxitoxin.

For the first time, Gonyaulax excavata cysts have been shown to be toxic. Bottom sediments from a water depth of 90 meters off the Maine coast were extremely rich in cysts, which were approximately ten times more toxic than the corresponding motile stages. Cysts are probably ingested by shellfish, thereby causing shellfish toxicity in deeper water offshore and contributing to shellfish toxicity in shallower coastal waters. A new approach to the problem of paralytic shellfish poisoning is therefore needed, one that takes into account benthic cysts and sedimentary factors affecting their distribution. The possible dangers of spreading poisoning through human activities must be considered. (EIS-Deal)
W79-03447

ENDRIN AND MALATHION TOXICITY TO FLAGFISH (JORDANELLA FLORIDAE),
Environmental Research Lab.-Duluth, MN.
R. O. Hermanutz.
ARCHIVES of Environmental Contamination and Toxicology, Vol. 7, p. 159-168, 1978. 1 fig, 4 tab, 16 ref.

Descriptors: *Pesticide toxicity, *Endrin, *Bioassay, *Insecticides, Mortality, Growth rates, Fish reproduction, *Toxicity, Chemical properties, Pesticide residues, Juvenile growth stage, Organophosphorus pesticides, Chlorinated hydrocarbon pesticides, Water pollution effects, *Malathion, *Flagfish, Jordanella.

Endrin and malathion effects on survival, growth, and reproduction of flagfish were determined in a flow-through system. Endrin chronic effects on first-generation growth and reproduction occurred

nly at 0.3 microg/l, the highest concentration ested. The mean endrin residues in the first-gen-eration fish at 65 days were about 15,000 times the water concentrations tested. Malathion concentra-ion of 31.5 microg/l and 24.7 microg/l, the high-st concentration tested, had detrimental effects on irst-generation survival. During the same period nalathion concentration as low as 10.9 microg/l ignificantly affected growth. Neither insecticide, t the concentrations tested, had any detectable effects on the second generation during a 30-day exposure period. Acute toxicities to juvenile fish were also determined in the same flow-through ystem. (EIS-Deal)
W79-03448

THE BIOGEOCHEMISTRY OF HEAVY METALS IN POLLUTED LAKES AND STREAMS AT FLIN FLON, CANADA, AND A PROPOSED METHOD FOR LIMITING HEAVY-METAL POLLUTION OF NATURAL WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
T. A. Jackson.
Environmental Geology, Vol. 2, No. 3, p. 173-189, 1978. 14 fig, 6 tab, 70 ref.

Descriptors; *Heavy metals, Effluents, *Waste reatment, *Zinc, *Cadmium, *Copper, *Mercury, *Iron, Mine wastes, Industrial wastes, Geochemis-ry, Biochemistry, Chemical analysis, Eutrophica-ion, Bottom sediments, Sewage effluents, Aquatic lgae, Seston, *Smelter wastes.

The biogeochemistry of Zn, Cd, Cu, Hg, and Fe in lakes and streams polluted by mines and smelter wastes emitted at Flin Flon, Canada, was investigated. In Schist Lake, a repository for both tailings-pond drainage and sewage, green algal blooms generated by nutrients from sewage promote entrapment of metals in sediments by (1) accumulation of metals from solution by algal seston, with preferential uptake of Zn, the most abundant metal, followed by sinking of the seston; and (2) production of H2S during decomposition of dead algae, resulting in sulfide precipitation. Metals are partially resolubilized from seston as it decomposes while sinking. In bottom muds, partitioning of a metal between sulfide and organic matter is strongly dependent on the stability of the metal sulfide as measured by its standard entropy. Metals were concentrated in H2S-rich muds and extraction of muds with various solvents and by electrodialysis showed that sulfide was much more effective than organic matter in suppressing remobilization of metals. These results indicate that introduction of sewage together with heavy-metals effluents into settling ponds could be an effective and economic method for limiting heavy-metal pollution of natural waters. (EIS-Deal)
W79-03449

TEST ORGANISMS AND METHODS USEFUL FOR EARLY ASSESSMENT OF ACUTE TOXICITY OF CHEMICALS,
Dow Chemical, Midland, MI. Health and Environmental Research.
For primary bibliographic entry see Field 5A.
W79-03450

REQUIREMENT OF RAINBOW TROUT FOR DIETARY ZINC,
Tokyo Univ. of Fisheries. (Japan). Lab. of Fish Nutrition.
O. Ogino, and G. -Y. Yang.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 9, p. 1015-1018, 1978. 2 fig, 6 tab, 5 ref.

Descriptors: *Rainbow trout, *Zinc, *Fish diets, Fish physiology, Trace elements, Metals, Water chemistry, Fish diseases, Animal pathology, Animal metabolism, Growth rates, Mortality, Toxicity, Nutrient requirements, Iron, Copper, *Tissue analysis.

The requirement of rainbow trout for dietary zinc was investigated by feeding them with diets containing graded levels of zinc. The results of the present study demonstrate that zinc is an essential trace element in the diet of rainbow trout, even though rearing water contains a low concentration of this element (11 microg/l). The fish fed a diet low in zinc content (1ppm) showed an extremely low growth rate and high mortality. A large number of the fish on the zinc-deficient diet were found to suffer from cataracts in the eyes and erosion of the fins and of the skin. The dietary zinc levels also influenced the digestibility of protein and carbohydrate, especially that of protein. The proximate composition of the fish body and the contents of trace elements in the various organs varied according to the dietary zinc levels. Judging from the growth rate of the fish, an adequate zinc content of the diet of rainbow trout was estimated to be 15 to 30 ppm. (EIS-Deal)
W79-03451

ON CHANGES IN THE DENSITY AND SHAPE OF PULP WASTES IN PAPER MILL EFFLUENT AND RIVER WATER OF THE FUJI DISTRICT BEFORE AND AFTER TREATMENT OF THE EFFLUENT (IN JAPANESE),
Takai Univ., Shizuoka (Japan). Faculty of Marine Science and Technology.
T. Mizushima.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 49, 1978, No. 9, p. 989-997. 4 tab, 7 fig, 6 ref.

Descriptors: *Water pollution effects, *Pulp wastes, Pulp and paper industry, On-site-investigations, Sediments, Industrial wastes, Methodology, Pollutant identification, Pollution abatement, *Particulate matter, *Japan, *Particulate length, *Particle weight.

The Hedoro pollution of Tagonoura Bay by paper mill effluent from the Fuji district is reported to have improved markedly in recent years. In order to determine the mechanism of this improvement, a study was made of the particulate matter pulp wastes present in the effluent within the paper mill of highest production and in the river water of the Fuji district. This report presents the main results of a comparison of the particulate matter before and after treatment of the effluent. (1) It was found that in the river water the water sampling method resulted in collection of a greater proportion of small waste particles, whereas the net sampling method took mainly large waste particles. (2) The comparison with the waste present in the effluent within the mill showed a sharp decrease in weight (to 1/300), number (to 1/44), and mean length (1/3.3), and a marked change in the shape distribution of the particulate matter. (EIS-Katz)
W79-03453

INFLUENCE OF HEAT FROM THE GENTILLY NUCLEAR POWER STATION ON WATER TEMPERATURE AND GASTROPODA,
Quebec Univ., Trois-Rivieres.
G. Vaillancourt, and R. Couture.
Canada Water Resources Journal, Vol 3, No 3, p 121-133, 1978. 6 fig, 2 tab, 1 ref.

Descriptors: *Nuclear powerplants, *Thermal pollution, *Mollusks, Mortality, Toxicity, Heated water, Water temperature, Cooling water, Thermal stress, *Aquatic algae, Water pollution effects, Scenedesmus, Gastropods, Growth rates, Animal metabolism, Phytoplankton, Pediastrum, Thermal effluent.

The paper deals with the effects of an increase in water temperature caused by the operation of the Gentilly Nuclear Power Station on the physical characteristics of the environment and on some species of mollusc. The results show an increase in the temperature in the discharge cone of almost 10C when the reactor is operating at maximum power. In this situation, mortality among the molluscs increases to the point where they disappear completely. An outline of the simulation studies that were made on a few unicellular algae is also presented. (EIS-Deal)
W79-03454

MIGRATORY BIRD MANAGEMENT AND INDUSTRIAL COOLING IN NORTHERN CLIMATES,
Canadian Wildlife Service, Edmonton (Alberta). Western and Northern Region.
R. W. Prach, and D. C. Surrendi.
Canadian Water Resources Journal, Vol 3, No 3, p 11-120, 1978. 3 tab, 9 ref.

Descriptors: *Migratory birds, *Mallard duck, *Thermal pollution, Animal behavior, Ducks(Wild), Canada, Migration patterns, Overwintering sites, Mortality, Thermal powerplants, Heated water, Water temperature, Cooling waters, Environmental effects, Water pollution sources, Wildlife management, *Thermal effluent.

Migratory birds overwintering at Lake Wabasmun, Alberta, were investigated. Data are given on numbers and species composition. Overwintering mallards were studied in detail. Open water appears to be the major factor causing mallards to overwinter. Overwintering mallard populations for 1976-77 and 1977-78 were approximately 3,000 and 700 birds respectively. Sex ratios tend to be biased towards males because of the greater tendency for females to migrate and higher mortality for those females remaining. Problems and opportunities available to resource managers as a result of warm water effluent are discussed. (EIS-Deal)
W79-03455

SEEVOGEL ALS INDIKATOREN FUR ZEITLICH UND ORTLICH BEGRENZTE MEERESVERSCHMUTZUNG IM GEBIET VON HELGOLAND (DEUTSCHE BUCHT) (SEA BIRDS AS INDICATORS OF ACCIDENTAL MARINE POLLUTION IN THE HELGOLAND AREA, GERMAN BIGHT),
Institute fuer Vogelforschung, Helgoland (Germany, F.R.) Inselstation.
G. Vauk.
Veroffentlichungen des Instituts fur Meeresforschung in Bremerhaven, Vol 18, p 95-100, 1978. 1 fig, 2 tab, 3 ref.

Descriptors: Oil, *Oil pollution, *Mortality, *Water birds, Toxicity, Oil spills, Gulls, Water pollution effects, Organic compounds, Phosphothicate pesticides, Pesticide toxicity, Animal pathology, *Parathion, *Kittiwakes, Tissue analysis, Guillemots.

Between January and April 1978, 116 dead or moribund sea birds were collected at Helgoland beaches. 56 birds, mostly guillemots and kittiwakes died from an oil pollution of unknown origin and extension. The majority of 60 unoiled birds, mostly kittiwakes and herring gulls, exhibited symptoms of poisoning. Methyl parathion could be identified in one of the herring gulls. (EIS-Deal)
W79-03457

THE EFFECT OF IN VIVO EXPOSURE OF ENDRIN ON THE ACTIVITIES OF ACID, ALKALINE AND GLUCOSE-6-PHOSPHATASES IN LIVER AND KIDNEY OF OPHIOCEPHALUS (CHANNA) PUNCTATUS,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
K. V. Sastry, and S. K. Sharma.
Bulletin of Environmental Contamination and Toxicology, Vol 20, No 4, p 456-460, 1978. 1 tab, 19 ref.

Descriptors: *Enzymes, *Endrin, *Pesticide toxicity, *Chlorinated hydrocarbon pesticides, Pesticide kinetics, Fish physiology, Animal metabolism, Biochemistry, *Toxicity, Water pollution effects, Path og pollutants, Proteins, Tissue analysis, Channa, Liver, Kidney.

The effects of in vivo exposure of a sublethal concentration of endrin on the activities of acid, alkaline and glucose-6-phosphatases in the liver and kidney of Ophiocephalus punctatus was studied. The period of exposure was twenty days. In the liver, alkaline phosphatase and glucose-6-phosphatase activities were decreased but acid phosphatase was stimulated. Kidney showed stimula-

tion in the activity of all the three phosphatases. (EIS-Deal)
W79-03458

A COMPARISON OF THE VARIABILITY OF ASELLUS COMMUNIS (CRUSTACEA: ISOPODA) AND GAMMARUS PSEUDOLIMNAEUS (CRUSTACEA: AMPHIPODA) AND SUITABILITY FOR JOINT BIOASSAYS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5A.
W79-03459

EFFECTS OF SELECTED HEAVY METALS ON EARLY LIFE OF SOCKEYE AND PINK SALMON,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
J. A. Servizi, and D. W. Martens.
Progress Report No. 39, 1978. 26 p, 13 tab, 3 fig, 29 ref.

Descriptors: *Toxicity, *Mortality, Bioassay, Methodology, *Metals, *Cadmium, *Copper, *Mercury, Water pollution effects, Freshwater fish, *Salmon, Sockeye salmon, Pink salmon, Juvenile fish, Fish eggs, Juvenile growth stage, Growth rates, Biological membranes, *Biological concentration, Malformation.

Sockeye and salmon were exposed continuously to cadmium, copper, and mercury under laboratory conditions during the egg to fry stage. Observations of mortality, hatching, development and growth were used to evaluate toxic effects. Mortality, hatching, and growth of sockeye salmon during the egg to fry stage were not affected by continuous exposure to 5.7 microg/l cadmium. However, the 168 hr LC50 for first feeding fry was 8 microg/l cadmium. When exposed to copper, the incipient lethal level was between 37 and 78 for sockeye but between 25 and 55 microg/l for pink salmon during the egg to fry stage. Growth and hatching were no better than mortality as indicators of toxic effects of copper. Copper inhibited egg capsule softening, but associated mortalities during hatching occurred only at concentrations also lethal to eggs and alevins. Copper was concentrated by eggs, alevins and fry in proportion to exposure concentrations. Copper concentrations of 105 and 6.8 ppm in pink salmon eyed eggs and fry, respectively, coincided with mortalities. Continuous exposure of eggs to 2.5 microg/l mercury caused malformed embryos at hatching. Mortality, growth, and hatching were less sensitive to mercury than was malformation. Mercury was concentrated by sockeye and pink salmon in proportion to exposure concentration during the egg to fry stage. Mercury concentrations of 1.87 ppm in eyed eggs coincided with malformed embryos at hatching. (EIS-Katz)
W79-03460

SUBLETHAL EFFECTS OF WEST POINT TREATMENT PLANT EFFLUENT ON COHO SALMON,
Municipality of Metropolitan Seattle, WA.
J. A. Buckley, and C. M. Whitmore.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec 4-6, 1974, Seattle, p 3-7, 1 tab, 2 fig.

Descriptors: *Toxicity, *Bioassay, Water treatment, *Washington, *Salmon, Laboratory tests, *Sewage, Sewage disposal, Sewage effluents, Sewage treatment, Ammonia, Chlorine, Nitrogen compounds, Fish physiology, Treatment plant outfall, Hemoglobin, Hematology, Sublethal effects, Sublethal stress.

Results indicate no significant stress to test fish exposed to 0.3 percent effluent. However, sublethal stress did occur to fish exposed to 1.1 percent effluent which approximates the concentration of effluent in the immediate area of the treatment plant outfall when poor mixing conditions prevail. Such conditions would be unlikely to occur for more than a very short time and in a small area adjacent to the diffuser. Of the measures of sublethal stress used in the study, hemoglobin and information from blood smears were the most valuable. (EIS-Katz)
W79-03461

USE OF SODIUM THIOSULFATE DECHLORINATED MUNICIPAL WATER IN SALMON CULTURE,
Weyerhauser Co., Springfield, OR.
For primary bibliographic entry see Field 5B.
W79-03462

INTERFACING HYDROTHERMAL AND BIOLOGICAL STUDIES IN WASTE HEAT MANAGEMENT,
MacLaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5B.
W79-03463

EVIDENCE OF RESISTANCE TO METALS IN LARVAE OF THE MIDGE CHIRONOMUS TENTANS IN A METAL CONTAMINATED LAKE,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
R. Wentsel, A. McIntosh, and G. Atchison.
Bulletin of Environmental Contamination and Toxicology, Vol 20, No 4, p 451-455, 1978. 1 fig, 3 tab, 3 ref.

Descriptors: *Heavy metals, *Diptera, *Mortality, *Midges, Bioassay, Toxicity, Larval growth stage, Animal physiology, Animal metabolism, Adaptation, Resistance, Lakes, Eutrophication, Cadmium, Zinc, Chromium, Chemical wastes, Industrial wastes.

Chironomid larvae were collected from two areas of a lake, one contaminated by heavy metals and one uncontaminated, and subjected to a series of tests to determine if metal resistant strains have developed within the lake. Only 47.5% of the larvae from the unpolluted region survived in highly contaminated sediment used in the 96-hour bioassay. Chironomids obtained from the polluted region of the lake had a survival rate of 75%, suggesting that this population may be somewhat resistant to heavy metal contamination. (EIS-Deal)
W79-03464

LOWERING OF SERUM THYROXINE AND TRIIODOTHYRONINE LEVELS IN YEARLING COHO SALMON, ONCORHYNCHUS KISUTCH, BY DIETARY MIREX AND PCBS,
Guelph Univ. (Ontario). Dept. of Zoology.
J. F. Leatherland, and R. A. Sonstegard.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 10, p. 1285-1289, 1978. 3 fig, 14 ref.

Descriptors: *Fish physiology, *Polychlorinated biphenyls, *Sockeye salmon, *Toxicity, Fish diets, Growth rates, Animal metabolism biochemistry, Proteins, Chlorinated hydrocarbon pesticides, Pesticide toxicity, Path of pollutants, Fish behavior, Pesticide residues, *Mirex, Tissue analysis, *Thyroxine, Hormones.

Yearling coho salmon were fed diets contaminated with PCBs or a mixture of Mirex and PCBs daily for 2 or 3 mo. Serum T3 and T4 levels were significantly reduced in fish fed the high Mirex diet for 2 or 3 mo. Serum T3 levels were reduced in fish fed the high PCB diet for 3 mo. Serum T3 and T4 levels were significantly reduced in fish fed the Mirex-PCB diet for 3 mo. The significant increase in serum T3/T4 ratios in fish given the high Mirex or high PCB diet was not evident in fish given the mixed Mirex-PCB diet, suggesting a synergistic effect that is different from the effect of individual contaminants. Fish given the high PCB or high Mirex diet had significantly lower body weights than the control fish. (EIS-Deal)
W79-03465

ENVIRONMENTAL IMPLICATIONS IN THE DESIGN OF COOLING WATER INTAKES,
MacLaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 8I.
W79-03466

SIMULATION ANALYSIS OF THE CONCENTRATION PROCESS OF TRACE HEAVY METALS BY AQUATIC ORGANISMS FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5B.
W79-03467

CHROMIC ACID IN ASSIMILATION STUDIES - A CAUTION,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
S. H. Bowen.
Transactions of the American Fisheries Society, Vol 107, No 5, p 755-756, 1978. 4 ref.

Descriptors: Fish physiology, *Fish food organisms, Periphyton, Animal metabolism, Chemical properties, Water chemistry, Acids, Biochemistry, Absorption, Digestion, Path of pollutants, *Chromic acid, Tissue analysis, Bioaccumulation, *Sarotherodon.

Chromic oxide is frequently used as a reference compound to measure assimilation of food components by fishes and other animals. Experiments using juvenile Sarotherodon mossambicus indicated that the fish was able to reject chromic oxide when it was added to their diets. It was hypothesized that other fish may possess this ability. This possibility should be considered before the accuracy of the chromic oxide reference techniques are assumed. (EIS-Deal)
W79-03468

EFFECTS OF SEDIMENT ADDITION ON MACROBENTHIC INVERTEBRATES IN A NORTHERN CANADIAN RIVER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
D. M. Rosenberg, and A. P. Wiens.
Water Research, Vol 12, p 753-763, 1978. 5 fig, 5 tab, 31 ref.

Descriptors: *Channels, *Sediment load, *Bottom sediments, Sediments, Channel morphology, Benthic fauna, Seasonal, Oligochaetes, Stoneflies, Mayflies, Diptera, Habitats, Canada, Particle size, Suspended solids, Construction, Pipelines, Biological communities, Animal behavior, Insect drift.

Two channels built into the Harris River, Northwest Territories were used to study responses of invertebrates to sediment addition. Sediment was added to one channel continuously for approximately 5 h. The other channel was used as a control. As a result of sediment addition, numbers of macrobenthos drifting from the sediment addition channel increased significantly over those drifting in the control in August and September. Significantly higher numbers of macrobenthos drifted in fall than summer. Numbers of macrobenthos drifting during sediment addition were significantly related to time in fall but not in summer, indicating a seasonal difference in temporal response to sediment addition. (EIA-Deal)
W79-03470

EFFECT OF SEASONAL PHOTOPERIOD ON ACUTE TOXICITY RESPONSES OF JUVENILE RAINBOW TROUT (SALMO GAIRDNERI) TO PULPMILL EFFLUENT,
British Columbia Research Council, Vancouver Div. of Applied Biology.
D. J. McLeay, and M. R. Gordon.
Journal of the Fisheries Research Board of Canada, Vol 35, p 1388-1392, 1978. 2 fig, 1 tab, 19 ref.

Descriptors: *Rainbow trout, *Photoperiodism, *Pulp wastes, *Toxicity, Juvenile growth stage.

Seasonal, Pulp and paper industry, Chemical wastes, Bioassay, Heat resistance, Water temperature, Fish physiology, Mortality, Animal metabolism, Carbohydrates.

Acute toxic responses to bleached kraft pulpmill effluent were compared for groups of underyearling rainbow trout reared under constant temperature and either a summer or winter photoperiod. Toxicity tests included a 96-h LC50 bioassay, a 4.5-h sealed-jar test, an 18-h temperature tolerance test, and a 4-h blood-sugar stress bioassay. For all tests the threshold-effect concentration of effluent was not affected by photoperiod. (EIS-Deal)
W79-03471

CHRONIC TOXICITY OF WATER-BORNE AND DIETARY LEAD TO RAINBOW TROUT (SALMO GAIRDNERI) IN LAKE ONTARIO WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
P. V. Hodson, B. R. Blunt, and D. J. Spry.
Water Research, Vol. 12, p. 869-878, 1978. 7 fig, 3 tab, 30 ref.

Descriptors: *Lead, *Toxicity, *Rainbow trout, Heavy metals, Iron, Amino acids, Proteins, Biochemistry, Fish physiology, Animal metabolism, Enzymes, Water chemistry, Mortality, Lake Ontario, Fish diets, Path of pollutants, Tissue analysis, Bioaccumulation, Hemoglobin, Mutagens.

Rainbow trout exposed to lead in Lake Ontario water demonstrated a 21-day LC50 of 2.4 mg 1-1 lead. Highest concentrations occurred in opercular bone followed by gill and kidney. Lead accumulation by brain was not clearly demonstrated. Exposure to lead in water at concentrations as low as 13 microg 1-1 caused significant increases in red blood cell (RBC) numbers, decreases in RBC volumes, decreases in RBC cellular iron content and decreases in RBC delta-amino levulinic acid dehydratase activity. No changes were observed in hematocrit or whole blood iron content. The changes indicated increased erythropoiesis to compensate for inhibition of hemoglobin production and increased mortality of mature red blood cells. Lead content of fish exposed to dietary lead was not elevated above control levels and the majority of lead consumed could be accounted for in the feces. Dietary lead may have slightly inhibited uptake of dietary iron. (EIS-Deal)
W79-03472

OXYGEN CONSUMPTION OF COHO SALMON IN A PUMPED SALTWATER RACEWAY,
Weyerhauser Co., Seattle, WA.
For primary bibliographic entry see Field 8I.
W79-03473

EFFECTS OF METHYLMERCURY EXPOSURE ON SEA WATER ADAPTATION OF JUVENILE COHO SALMON AND STEELHEAD TROUT,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
B. P. McPherson, and D. R. Buhler.
In: Twenty-third Annual Northwest Fish Culture Conference, Nov 30-Dec 1, 1972, Seattle, Washington, p 43-46. 1 tab, 3 fig, 4 ref.

Descriptors: *Bioassays, Mortality, *Mercury, Metals, *Water pollution effects, *Methylmercury, Rainbow trout, Steelhead trout, *Coho salmon, Salinity, Laboratory tests, Bioassay, Bioaccumulation, Histology, Pathology, Histological observations, Seawater, *Sea water adaptation, Fish migration, Fish physiology.

An attempt was made to test in the laboratory a method that was constructed to evaluate the effects of methylmercury on coho salmon. Histological studies of the tissues of the challenged fish indicated changes that might affect the ability of fish to adapt to marine water. (EIS-Katz)
W79-03475

EFFECTS OF HOLDING TEMPERATURES ON REPRODUCTIVE DEVELOPMENT IN ADULT SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Corvallis Environmental Research Lab., OR.
G. R. Bouck, G. A. Chapman, P. W. Schneider, and D. G. Stevens.
In: 26th Annual Northwest Fish Culture Conference, Dec. 3-5, 1975, Otter Rock, Oregon, p 24-40. 9 tab, 3 fig, 6 ref.

Descriptors: *Aquiculture, *Sockeye salmon, *Bioassay, Laboratory tests, Columbia River, *Water temperature, Mortality, *Thermal pollution, Thermal stress, Water pollution effects, Growth, Fish disease, Bacteria, Fish eggs, Fish physiology, Fish reproduction.

Wild adult sockeye salmon (Oncorhynchus nerka) were captured and placed into tanks supplied with Colmubia River water so that the effects of four temperature treatments could be determined. Treatment included an initial acclimation period wherein temperatures changed about 2C per day until they reached test temperatures of 10, 16.5, 20 and 22C on day eight, and remained there until day 32 when cooling to 10C began. All surviving fish were sacrificed and examined on day 44. The results indicate that 22C was rapidly and directly lethal to all of the fish and while equally lethal, 20C resulted in complete mortality more slowly by infection rather than thermal death. Comparisons of fish surviving the 10C and 16.5C treatment revealed that 10C was associated with less frequent ventilaton of the gills, smaller livers, larger gonads, less geriatrophy and both a lower incidence and a lower antibody titer against Columnaris disease. The authors conclude that 10C would be more favorable for sexually maturing adult sockeye salmon than 16.5C. (EIS-Katz)
W79-03476

STUDIES ON NITRITE TOXICITY IN RAINBOW TROUT,
Bureau of Sport Fisheries and Wildlife, Bozeman, MT. Fish Cultural Development Center.
C. E. Smith.
In: 24th Annual Northwest Fish Culture Conference, Dec 5-7, 1973, Wemme, Oregon, p 22-25, 1 tab, 1 fig, 4 ref.

Descriptors: *Toxicity, Mortality, *Nitrogen compounds, *Bioassay, Laboratory tests, Fish hatchery, *Aquiculture, Rainbow trout, Growth, *Nitrites, Methodology.

Bioassays were conducted with rainbow trout to determine the toxicity of nitrites. LC50 concentrations for 12 gram rainbow trout were determined for periods of 48 to 384 hours. 2 gram trout were twice as resistant as 12 gram and larger trout. (EIS-Katz)
W79-03477

BASIC ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEMS OF THE NORTHWEST OF THE EUROPEAN PART OF THE USSR,
Akademiya Nauk SSSR, Leningrad. Inst. of Lake Management.
I. I. Nikolayev.
Hydrobiological Journal, Vol 13 (2), 1977, p 1-7. 40 ref. (translated from Russian).

Descriptors: *Lakes, Ecology, *Piscicides, Fish conservation, *Fish control agents, *Fish harvest, Nutrients, Fertilization, Fertilizers, Reservoirs, Hydroelectric power, *Reservoir fisheries, Reservoir operators, Reservoir stages, Water level, Irrigation requirements, Thermal effluents, Thermal effects, Aquatic plants.

Literature data and investigative results are used to analyze the main consequences of anthropogenic action on lake ecosystems. Examples are given of the complete reconstruction of the ecosystems of small lakes by using ichthyccides and subsequent stocking of the water bodies with the valuable ichthyfauna of ponds and the introduction of fertilizers. In the case of large lakes, the consequences of converting them into powerplant reservoirs and the variations in level connected with this are analyzed. In the case of medium-sized lakes, the effects of reducing the water level by using the water for irrigation are determined. The effects of the warm power-plant effluents on aquatic organisms are described. Examples of transplantation of ichthyofauna, invertebrates, and aquatic plants are given, and role of random factors is described. (EIS-Katz)
W79-03478

SOME PATTERNS OF CHANGE IN LACUSTRINE ECOSYSTEMS UNDER ANTHROPOGENIC INFLUENCE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
Z. Kajak.
Hydrobiological Journal, Vol. 13 (2), 1977, p. 8-16. 6 tab, 4 fig, 22 ref. (translated from Russian).

Descriptors: *Eutrophication, Nutrients, Water pollution effects, *Zooplankton, *Benthos, Polychaetes, Tubificid worms, *Water temperature, Freshwater fish, Carnivores, Phytoplankton, Biomass, *Mazurian lakes, Poland, Fertilizers, Primary production, Carp, Hypophthalmichthys.

Very rapid eutrophication of the Mazurian lakes has been noted. Under the influence of the influx of biogenic substances, a dystrophic lake was turned into a eutrophic one, while signs of degradation made their appearance in the polytrophic lake. Data were obtained on the feeding of the dominant plankton and benthos species (Dreissena, tubificid worms) and their role in the ecosystem. The production and production efficiency at the individual trophic levels were determined in different lakes, and the energy flow in the lake ecosystem was assessed. It was proved that warming the water improved its self-purification in four of the lakes studied, but was detrimental in the polluted river. Transplantation of Hypophthalmichthys molitrix into a lake produced a drastic decrease in the plankton, completely changed the biocoenosis and the purification function of the lakes. (EIS-Katz)
W79-03479

THE OXIDATION OF PETROLEUM HYDROCARBONS BY MARINE BACTERIA,
State Oceanographic Inst., Moscow (USSR).
A. B. Tayban, A. N. Zubakina, S. P. Barinova, and I. M. Mikhaleva.

Descriptors: Oil, *Oil pollution, *Bacteria, Oil spills, *Decomposing organic matter, *Oxidation, Petroleum hydrocarbons, *Marine bacteria, Alkanes, *Daily degradation rates, Arctic bacteria, Caspian Seas, Microbial degradation rates, Diesel oil.

The results of experiments designed to estimate the rate of the microbial oxidation of oil and hydrocarbons and to study the specific response of test cultures to individual n-alkanes are presented. It was proved that the degree of oxidation of oil and hydrocarbons by the individual cultures of marine bacteria and a mixed bacterial population isolated from the Caspian Sea and from the river Lena ranges from 20 to 98%; the n-alkanes were utilized most intensively. The daily degradation rate of hydrocarbons ranged from 20 to 470 mg/liter (at 20 to 25C). Arctic cultures assimilated the n-alkanes C16-C24 most actively, while the Caspian ones showed a preference for the lighter (C10, C12 and C14) hydrocarbons. (EIS-Katz)
W79-03480

TOXICITY OF CARBOFURAN TO BLUE-GREEN ALGA NOSTOX MUSCORUM,
Central Rice Research Inst., Cuttrack (India). Lab. of Blue-Green Algae.
S. Kar, and P. K. Singh.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 707-714, 1978. 2 fig, 2 tab, 13 ref.

Descriptors: *Cyanophyta, *Pesticide toxicity, *Biodegradation, *Toxicity, Pesticides, Growth

rates, Nitrogen fixation, Metabolism, Photosynthesis, Chlorophyll, Tolerance, Optical properties, Cytological studies, *Furadan, *Carbofuran, *Nostoc.

The effects of commercial grade pesticide furadan (3% a.i. as carbofuran) on the survival, growth and nitrogen fixation of blue-green algae was studied. The lower concentration of furadan (25 microg/ml) enhanced survival, growth and nitrogen fixation in the alga whereas these were gradually inhibited in higher concentrations (50-1000 microg/ml). The presence of more than 1200 microg/ml was algicidal. Preliminary observations revealed that the pesticide is biodegraded by the alga. (EIS-Deal)
W79-03482

BIOCONCENTRATION RATIO OF DIAZINON BY FRESHWATER FISH AND SNAIL,
National Inst. of Agricultural Sciences, Tokyo (Japan).
J. Kanazawa.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 613-617, 1978. 1 fig, 2 tab, 4 ref.

Descriptors: *Diazinon, *Pesticide kinetics, *Pesticide residues, Path of pollutants, Organophosphorus pesticides, Carp, Crayfish, Snails, Fish physiology, Animal physiology, Animal metabolism, Enzymes, Bioconcentration, Tissue analysis, *Grudgeon, Guppy, Diazinon.

The bioconcentration ratios of diazinon from water by freshwater fishes were generally larger than that of crayfish and snails. Among fishes, the bioconcentration ratio of diazinon by topmouth grudgeon was the highest. However, elimination of diazinon from fish was linearly rapid. The influence of test concentration on the bioconcentration ratio was not considerable. The bioconcentration ratio of diazinon in whole body of topmouth grudgeon increased proportional to the body weight. (EIS-Deal)
W79-03483

PCB RESIDUES IN MULLET, MUGIL CEPHALUS, FED TO CAPTIVE EASTERN AUSTRALIAN WATER RATS, HYDROMYS CHRYSOGASTER,
Commonwealth Scientific and Industrial Research Organization Lyneham (Australia). Div. of Wildlife Research.
For primary bibliographic entry see Field 5B.
W79-03484

ARSENIC CONCENTRATION IN CANNED TUNA FISH AND SARDINE,
Tehran Univ. (Iran). Dept. of Toxicology.
For primary bibliographic entry see Field 5A.
W79-03485

CADMIUM-INDUCED PHAGOCYTE CYTOXICITY,
Albany Medical Coll., NY. Inst. of Comparative and Human Toxicology.
L. D. Loose, J. B. Silkworth, and D. Warrington.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 582-588, 1978. 2 tab, 18 ref.

Descriptors: *Cadmium, *Cytological studies, *Toxicity, Chemical analysis, Animal physiology, Biochemistry, Chlorides, Metals, Ions, Water pollution effects, *Tissue analysis, *Acetates, *Phagocytes, *Macrophages, *Neutrophils.

At equal concentrations cadmium acetate was significantly more cytotoxic than cadmium chloride to mouse peritoneal macrophages. The converse was observed with polymorphonucleated neutrophils. No preferential cytoxicity to pulmonary alveolar macrophages was manifested either by cadmium acetate or cadmium chloride. (EIS-Deal)
W79-03486

MERCURY DETERMINATION IN A RIVER OF MOUNT AMIATA,
Siena Univ. (Italy). Chair of Hydrobiology and Fish-Culture.
For primary bibliographic entry see Field 5A.
W79-03487

MERCURY BURDENS IN CRAYFISH FROM THE WISCONSIN RIVER,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
For primary bibliographic entry see Field 5A.
W79-03488

RESPIRATION, GROWTH AND FOOD CONVERSION EFFICIENCY OF PINFISH (LAGODON RHOMBOIDES) EXPOSED TO SUBLETHAL CONCENTRATIONS OF BLEACHED KRAFT MILL EFFLUENT,
Florida State Univ., Tallahassee. Dept. of Biological Science.
A. W. Stoner, and R. J. Livingston.
Environmental Pollution, Vol 17, p 207-217, 1978. 2 tab, 33 ref.

Descriptors: *Pulp wastes, *Toxicity, Fish physiology, *Respiration, *Growth rates, Animal metabolism, Biochemistry, Lipids, Proteins, Digestion, Effluents, Animal pathology, Fish diseases, Fish behavior, Pulp and paper industry, *Pinfish, Lagodon, Tissue analysis.

Young pinfish were exposed to 0.01%, 0.10% and 1.00% concentrations of neutralised bleached kraft mill effluent (BKME) for 28 days. Fish exposed to 1.00% BKME demonstrated elevated gill ventilation rates and were characterized by reduced total lipid content, reduced condition factor, increased moisture, and increased protein content when compared with controls. Control fish converted 44.6% of the ration to wet weight. Wet food conversions of pinfish exposed to 0.10% and 1.00% BKME were reduced by 47.8% and 73.5%. No respiratory, biochemical or food conversion differences were found between controls and fish exposed to 0.01% BKME. Differences were significant in concentrations of BKME less than 1.0% of the lethal concentration. (EIS-Deal)
W79-03490

SOME FEATURES OF ION EXCHANGE IN FISH DURING THEIR ADAPTATION TO A HIGHER CO2 CONTEST IN THE WATER,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
V. D. Romanenko, and V. A. Krisal'nyy.
Hydrobiological Journal, Vol 13 (2), 1977, p 73-76, 2 fig, 8 ref. (translated from Russian).

Descriptors: *Freshwater fish, *Fish physiology, Biochemistry, *Carbon dioxide, Ion exchange, Ion transport, Fish diseases, Acidity, Oxygen, Bicarbonate, Water quality, *Carp, Bicarbonate buffer system, Water pollution effects.

It was shown in chronic tests on carp that exposure in water with high (0.4, 0.8 and 1.1 mM/liter) content of free carbon dioxide produces changes in the bicarbonate buffer system of the blood, as well as sharp shifts in ion exchange. The content of bicarbonates, sodium and potassium in blood plasma increased so as to prevent carbon dioxide acedemia. In the complicated process of regulating homeostasis in fishes, an important place belongs to the redistribution of ions between the tissues and blood plasms. (EIS-Katz)
W79-03492

THE SURVIVAL OF THE YOUNG OF THE GREY MULLET MUGIL SALIENS RISSO IN THE PRESENCE OF PHENOL,
Odessa State Univ. (USSR).
F. S. Zambriborshch, and B. Lay.
Hydrobiological Journal, Vol 13 (2), 1977, p 82-84. 3 tab, 10 ref. (translated from Russian).

Descriptors: *Toxicity, Marine fish, *Bioassay, *Phenols, Juvenile fish, Juvenile growth stages, Survival rates, *Lethal concentrations, Water temperature, Water pollution effects, Laboratory tests, Methodology, *Mugil saliens, Mullet.

In investigations of the survival rate of the fry of Mugil saliens Risso at phenol concentrations of 5 to 30 mg/liter, an inverse correlation was established between these factors. The average lethal concentration of phenol (LC50) at an exposure of 24 hours was 21.5 mg/liter, at a 48 hour exposure it was 16.6 mg/liter and with 72 hours, 15.5 mg/liter. The life of the fish in the presence of phenol decreased with a decrease in water temperature. (EIS-Katz)
W79-03493

THE EFFECTS OF SODIUM LAURYL SULFATE ON THE STEROL FRACTION OF MYA ARENARIA,
Institute of Biology of the Southern Seas, Odessa (USSR).
R. P. Kandyuk, and V. I. Palamarchuk.
Hydrobiological Journal, Vol 13 (2), 1977, p 84-87. 1 tab, 2 fig, 10 ref. (translated from Russian).

Descriptors: Water pollution effects, *Detergents, *Molluscs, Clams, Biochemistry, Animal metabolism, Animal physiology, Sterols, *Toxicity, Chromatography, Water pollution effects, Commercial shellfish, *Anionic detergents, *Sodium lauryl sulfate, *Mya arenaria, *Black Sea.

The anionic detergent sodium lauryl sulfate disrupts the metabolic processes in the new Black Sea arrival of M. arenaria, in particular changing the content of total and individual sterols. An 0.01% dose of the detergent at an exposure of three days proved highly toxic to the mollusks which was reflected in the death of some individuals. (EIS-Katz)
W79-03494

ACCLIMATION TEMPERATURE AND TEMPERATURE TOLERANCE IN FINGERLING LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
North Texas State Univ., Denton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5G.
W79-03496

SOME ASPECTS OF THE BIOLOGY AND HEAVY METAL ACCUMULATION OF THE FISH LIPARIS LIPARIS IN THE SEVERN ESTUARY,
Bath Univ. (England). School of Biological Sciences.
K. S. Badsha, and M. Sainsbury.
Estuarine and Coastal Marine Science, Vol 7, p 381-391, 1978. 6 fig, 6 tab, 5 ref.

Descriptors: *Growth rates, *Heavy metals, *Fecundity, Lead, Zinc, Cadmium, Food habits, Fish behavior, Fish physiology, Animal metabolism, Path of pollutants, Fish populations, Seasonal, Fish migration, Fish reproduction, *Liparis, Tissue analysis, Bioaccumulation.

The feeding habits, rates of growth, fecundity and other aspects of the general biology of Liparis liparis from the Severn estuary are reviewed for the period 1973-1976. Additionally the levels of heavy metals present in the tissues of L. liparis have been determined and compared with those found in related teleost species. (EIA-Deal)
W79-03497

REDUCED TOXICITY OF AN AQUEOUS COAL-CONVERSION EFFLUENT FOLLOWING WASTE DISPOSAL TREATMENT,
Tennessee Univ., Oak Ridge. Graduate School of Biomedical Science.
T. W. Schultz, S. T. Perry, and J. N. Dumont.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 633-639, 1978. 2 fig, 1 tab, 15 ref.

criptors: *Protozoa, *Waste water treatment, xicity, *Filtration, Growth rates, Animal be-ior, Animal populations, Oxygen demand, als, *Fossil fuels, Effluents, Bioassay, Animal abolism, Respiration, Chemical wastes, Indus- wastes, Phenols, Coal-conversion effluent, trahymena, *Coal converson.

purpose of this report is to examine the bio-cal effects of the liquid effluent stream from the 'contact' bioreactor unit on a model system - ciliate Tetrahymena pyriformis. As concentra-s increased above 20%, dose-dependent rela-ships were noted in behavioral modifications - loss of motility) and oxygen uptake (re-ed). The population growth rate was not al-d by the concentrations tested. It was conclud-hat the treatment of coal-conversion effluents successful in reducing the toxicity of the efflu- (EIA-Deal)
9-03498

XICOLOGICAL COMPARISON OF NATU-L AND CULTURED POPULATIONS OF ARTIA TONSA TO CADMIUM, COPPER D MERCURY,
vironmental Research Lab., Narragansett, RI.
. Sosnowski, and J. H. Gentile.
rnal of the Fisheries Research Board of ada, Vol 35, p 1366-1369, 1978. 3 tab, 13 ref.

scriptors: *Cadmium, *Copper, *Mercury, oxicity, *Copepods, Metals, Heavy metals, Ge-cs, Biological communities, Aquatic popula-s, Mortality, Bioassay, Nutrient requirements, nity.

tured Acartia tonsa manifested a reproducible icological response through six generations. ere were no statistically significant differences he responses of F1 and F6 generations to cad-m, copper, and mercury. Cultured and field ulations (parental) exposed to cadmium did not nifest statistically different response patterns. e response variability of cultured populations s less than that of field populations. (EIS-Deal)
9-03499

FECTS OF ENVIRONMENTAL CALCIUM NTENT ON PLASMA CALCIUM LEVELS GOLDFISH,
goya Univ. (Japan). Fisheries Lab.
Umehara, and M. Oguri.
lletin of the Japanese Society of Scientific Fi-res, Vol 44, No 8, p 827-833, 1978. 5 fig, 2 tab, ref.

scriptors: *Calcium, *Fish physiology, Animal tabolism, Sea water, Enzyme, Freshwater, Tox-y, Cytological studies, Chemical analysis, ter chemistry, Hydrogen ion concentration, dium, Potassium, *Goldfish, Carassius, Tissue lysis, *Histology.

e authors investigated the effects of Ca2+ in vironmental water on goldfish plasma Ca2+ els. Plasma Ca2+ levels increased markedly in ldfish transferred to 1/3 diluted sea water. How-er, the levels did not change in the goldfish nsferred to Ca2+-rich fresh-water. Further-re, in the goldfish transferred to 1/3 sea water, histological structures of the corpuscle of Stan-s, water movement rate in the intestine and 2+-activated ATPase activity in gill changed nificantly. On the contrary, these changes were t observed in goldfish transferred to Ca2+-rich sh-water. (EIS-Deal)
79-03500

D. Waste Treatment Processes

VALUATION AND COMPARISON OF OVER-AND FLOW AND SLOW RATE SYSTEMS TO PGRADE SECONDARY WASTEWATER AGOON EFFLUENT,
ah State Univ., Logan. Coll. of Engineering.
. C. Kemp, D. S. Filip, and D. B. George.
vailable from the National Technical Information Service, Springfield, VA 22161 as PB-291 726, Price codes: A04 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan Water Quality Series UWRL/Q-78/02, December 1978. 60 p, 58 fig, 42 tab, 2 append. OWRT A-034-UTAH(1). 14-34-0001-8047.

Descriptors: *Sewage treatment, *Overland flow, Irrigation, Lagoons, Oxidation lagoons, Waste water treatment, Waste disposal, *Slow rate systems, Tertiary treatment.

To evaluate the effectiveness of overland flow treatment in upgrading secondary wastewater lagoon effluent, three 15 x 36 m plots on a 2.5 percent slope were constructed and sown for a high density vegetative cover using Reed Canary grass. Wastewater was applied to the upper end of each plot at rates of 7.5, 15, and 22.5 cm/week. Results from the overland flow system investigation were compared with similar data obtained the preceding year from an existing slow rate land application system on an adjacent site. Secondary effluent from the same lagoon system was applied to the slow rate system study area. After evaluating influent and effluent water quality characteristics from both systems, site specific efficiencies were detailed. Overland flow as a tertiary treatment process may not be suitable to satisfy future discharge standards because of the minimum biochemical oxygen demand and suspended solids effluent concentrations that are attainable. Overland flow could be used as a nitrification-denitrification process if land costs were sufficiently low. The slow rate system can be an excellent tertiary treatment method if the groundwater is protected and no subsurface water collection and discharge is required. If a discharge is required, organic carbon and nutrient concentrations might be unacceptable depending upon initial site soil conditions.
W79-03007

FEDERAL GUIDELINES, STATE AND LOCAL PRETREATMENT PROGRAMS, VOLUME III, APPENDIX 8,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 783, Price codes: A18 in paper copy, A01 in microfiche. Report No. EPA-430/9-76-017c, January 1977. 409 p, 87 fig, 80 tab, 63 ref.

Descriptors: *Pre-treatment(Water), Waste water, *Industrial wastes, *Waste water treatment, Neutralization, Sedimentation, Filtration, Effluents, Liquid wastes, Treatment facilities, Publications, Pollutants, Adsorption, Activated carbon, Separation techniques, Treatment facilities, Public utilities, Sewerage.

Data concerning the major industries potentially contributing waste water to publicly owned sewer systems and treatment works are presented. Thirty-four major industrial categories, partially established by the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), are summarized according to the: (1) a general industry description of the products, raw materials, and waste characteristics; (2) the categorization and subcategorization developed by the EPA in the effluent guidelines program; (3) process descriptions; (4) waste characterization; and (5) control and treatment technology with in-plant controls and end-of-pipe treatment used. Pretreatment is generally required by EPA, states, and municipalities to prevent pollutants from being discharged through municipal systems. Pretreatment considerations involve assessment of individual plant effluents, in-plant control methods, recycle opportunities, water conservation and reuse possibilities. Such considerations may differ depending on whether or not the pollutants to be controlled are susceptible to treatment in a Publicly Owned Treatment Works (POTWS). Pretreatment for compatible and incompatible pollutants may take a variety of forms including coarse solids separation, grit removal, equalization, neutralization, dissolved air flotation, sedimentation, filtration, biological treatment, physical-chemical treatment, chemical precipitation and coagulation, activated carbon adsorption, and chemical conversion. (Davison-IPA)
W79-03009

A STUDY OF WASTE GENERATION, TREATMENT AND DISPOSAL IN THE METALS MINING INDUSTRY,
Midwest Research Inst., Kansas City, MO.
D. Bendersky, R. E. Gustafson, C. E. Mumma, K. R. Walker, and D. Costello.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 052, Price codes: A18 in paper copy, A01 in microfiche. Final Report No. SW-132c, October 1976. 406 p, 37 fig, 120 tab, 308 ref, 4 append.

Descriptors: *Waste disposal, *Mine wastes, *Metals, *Waste treatment, *Landfills, Tailings, Overburden, Waste rock, Copper, Lead, Zinc, Chromium, Cadmium, Antimony, Mercury, Uranium, Vanadium, Selenium, Asbestos, Arsenic, Beryllium, Waste identification, Cost analysis, Hazards.

The purpose of this study was to provide the Environmental Protection Agency with a data base regarding the current and projected types and quantities of the potentially hazardous wastes generated by the metals mining and concentrating industry, applicable treatment, and disposal technologies and their costs. According to the contract, specific attention was to be given to wastes containing asbestos, arsenic, lead, mercury, halogenated hydrocarbons, pesticides, selenium, and zinc. Other potential hazards included were carcinogens, chromium, and cadmium. The industry generated a total of 2,365 million tons of waste during 1974 consisting of waste rock, overburden, dry concentration wastes, and wet wastes. The largest amount of these wastes was produced by the copper industry with uranium-vanadium, lead-zinc, mercury, and miscellaneous ores following in that order. Overburden and waste rock, except for uranium ore waste rock, do not add to the potential hazards of the disposal site they occupy because their hazardous content is about the same as the site. Concentration process wastes, fine grained and subject to wind and water erosion, may contain potentially hazardous concentrations higher than their disposal site. Potentially hazardous substances have been identified in the land disposed wastes of the following: copper ore tailings, lead-zinc tailings, uranium ore waste rock, uranium ore tailings, antimony ore tailings, and beryllium ore tailings. Adequate waste treatment and land disposal methods are available to companies mining and concentrating copper, lead-zinc, zinc, mercury, and miscellaneous metals ores. Costs of waste disposal vary depending on the type of ore, mining method, and quantity of waste. (Davison-IPA)
W79-03010

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM, AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 695, Price codes: A04 in paper copy, A01 in microfiche. Report Nos. EPA-430/9-76-009, and MCD-30, April 1976. 67 p, 1 fig, 22 tab, 7 append.

Descriptors: *Waste treatment, *Sewage sludge, *Treatment facilities, *Sludge disposal, *Municipal wastes, Ocean disposal, Incineration, Landfills, Lagoons, Cities, Communities, Regional analysis, Capital costs, Maintenance costs, Operating costs, Environmental effects, Water Pollution Control Act, Sewage lagoons, Sewage disposal, Sewage ponds, Cost analysis.

A summary of information available on municipal sewer sludge production and alternatives for the disposal/utilization of municipal sewer sludge is presented. The major cities are the key problem areas of sludge disposal. Many are phasing out current ocean disposal, and have problems obtaining sites and approval of sludge management alter-

natives. Of the 22,000 municipal treatment plants, over 5,000 are waste water treatment ponds having few disposal problems. Fewer than 350 of the remaining 17,000 plants are larger than 10 MGD; 65% of the nation's plants are estimated at less than 1 MGD in design flow. Current methods of municipal sewage sludge disposal are estimated as follows: ocean disposal, 15%; incineration, 35%; landfill, 25%; and land applications, 25%. Not included in these estimates are the operations storing sludge in lagoons with no future disposal method planned. Sludge disposal practices vary within the states as well as within the regions, i.e., communities in the Midwest apply sludge to the land, the major inland cities use landfills and incineration, and only areas near the ocean utilize ocean disposal. Capital costs and operation and management costs, dependent upon such variables as energy, transportation, land, labor, monitoring requirements, and environmental regulations, vary greatly for the several sludge management alternatives. It is estimated that 30 to 50% of a conventional treatment plant's capital costs go for sludge management treatment and that more than $400 million/year are required for operation and management costs. (Davison-IPA)
W79-03011

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION, FORMULATION OF ALDRIN/DIELDRIN, DDT, ENDRIN, TOXAPHENE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 017, Price codes: A07 in paper copy, A01 in microfiche. Report Nos. EPA-440/9-76-015 and MRI-41227-C, June 1976. 124 p, 12 fig, 4 tab, 33 ref, 3 append. 68-01-3524.

Descriptors: *Industrial wastes, *Pesticides, *Waste water treatment, Technology, Aldrin, Dieldrin, Endrin, Toxaphane, Water use, Evaporation, Sewers, Landfills, Activated carbon, Adsorption, Incineration, Rain water, Economics, Capital cost, Operating costs, Models, Toxicity, Water pollution sources, Surface runoff, Cost comparison, Cost analysis, Water conservation, Waste water disposal.

Waste water management and associated costs at plants manufacturing aldrin/dieldrin, DDT, endrin, and toxaphene are examined. The entire pesticide formulation industry is characterized with regard to its waste water treatment technology, waste water management costs, the usage of water, and the source of waste water in these plants. Inplant control technology for eliminating the use of water and minimizing contamination of waste water discussed. Current and former practices such as evaporation systems, sewer systems, landfills, contract disposal, activated carbon adsorption, incineration are described. Methods for managing process waste water intended to achieve zero discharge of the cited pesticides include: elimination of process water, evaporation systems and contract disposal. Methods for managing rainwater runoff directed at achieving zero discharge include covering all formulation operations, removing or paving over contaminated soils, and diversion of 'clean' runoff. Estimates of capital investment and annual operating costs are made on the basis of model plants developed using the technology aimed at zero discharge of the designated pollutants. (Davison-IPA)
W79-03015

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR ENDRIN MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 015, Price codes: A06 in paper copy, A01 in microfiche. Final Report No. EPA-440/9-76-011, February 6, 1976. 100 p, 5 fig, 7 tab, 39 ref, 1 append. 4127-C, 68-01-3524.

Descriptors: *Waste water treatment, *Endrin, *Organic pesticides, *Halogenated pesticides, *Industrial wastes, Activated carbon, Sedimentation, Filtration, Neutralization, Adsorption, Resins, Degradation, Capital costs, Direct costs, Indirect costs, Pilot plants, Velsicol Chemical Corporation, Cost analysis, Cost comparisons.

The treatment of waste water resulting from the production of endrin, a stereo-isomer of dieldorin, by the Velsicol Chemical Corporation, the sole U.S. manufacturer of endrin, is examined. Plant capacity and production rate data were not available, but production for 1975 was estimated at 6 million pounds of endrin. Total waste water discharge from the plant averaged 3,514 gpm and contained an average of 2.5 lb of endrin/day in May 1975. Both process waste waters and cooling waters are contaminated with endrin. The current (1975) waste water treatment system consists of sedimentation, sand filtration, fine cartridge filtration, and neutralization. After treatment, the waste waters are discharged into the municipal sewer system. Four waste water treatment systems potentially effective in reducing the concentration of endrin and the daily load are examined in detail. The four systems are: resin adsorption, reductive degradation, resin adsorption and reductive degradation in series, and activated carbon adsorption. These systems are feasible according to laboratory experiments, and the first three are under laboratory pilot plant study at the site. The technology for the activated carbon system is available in other industries and is most likely transferable to endrin use. Waste water treatment cost estimates for these systems include capital investment costs, direct costs, and indirect costs. (Davison-IPA)
W79-03017

WASTEWATER TREATMENT IN COLD CLIMATES,
Army Terrestrial Sciences Center, Hanover, NH.
R. S. Sletten, and A. Uiga.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 156, Price codes: A02 in paper copy, A01 in microfiche. 1976. 15 p, 5 fig, 6 tab, 15 ref.

Descriptors: *Waste water treatment, *Alaska, *Treatment facilities, Aerated lagoons, Aeration, Arctic, Federal Water Pollution Control Act, Military reservations, Filtration, Ponding, Land management, Personnel, Weather.

Waste water treatment systems in use at remote military installations in Alaska are described, and techniques for upgrading these systems to meet EPA's secondary effluent criteria are discussed. Existing systems primarily use aerated lagoons and extended aeration package plants, and indications are that most of these systems could not meet EPA's secondary effluent criteria. Due to the remote, isolated nature of most of the camps, it is suggested that upgrading processes be as simple as possible to design, build and operate. Potentially feasible techniques include land application, intermittent filtration, and variations of ponding, although no one solution can be recommended for every situation because of the limiting factors of land availability for ponding and availability of suitable soils for land application or intermittent filters. To ensure effective waste water treatment in the Arctic, long range requirements include the availability of trained treatment plant operators and research into methods to make arctic weather as asset rather than a liability. (Gibson-IPA)
W79-03020

THE EFFECTS OF UV LIGHT ON TNT AND OTHER EXPLOSIVES IN AQUEOUS SOLUTION,
Naval Weapons Support Center, Crane, IN. Weapons Quality Engineering Center.
C. C. Andrews, and J. L. Osmon.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 132, Price codes: A04 in paper copy, A01 in microfiche. Report No WQEC/C-77-32, January 12, 1977. 65 p, 8 fig, 12 tab, 7 ref, 3 append.

Descriptors: *Waste water treatment, *Explosiv *Ultraviolet radiation, *Peroxide, Acetone, Org ic compounds, Chemical wastes, Effluents, Po tion abatement, Water pollution sources, Nitro compounds, Laboratory tests, Cyanide, Ammo

Four bench-scale ultraviolet (UV) light syst used in treating water contaminated with explo compounds were studied. The use of acetone hydrogen peroxide with the UV light are viewed. Small concentrations (0.1%) of hydro peroxide used with UV light yielded the best tr ment for removing TNT, Explosive D, cyclo (RDX), homocyclonite (HMX), 2, 4 DNT (dini toluene), and 2, 6 DNT from contaminated s tions. Each compound was eliminated within hour or less of hydrogen peroxide exposure decrease of their TOC load was observed. O negligible amounts, 10 to 50 ppb, of trinitroben were present after one hour of exposure, an appeared that the organic material was destroy The use of acetone in the UV continuous f system prototyped the UV-peroxide system, bu success was questionable because of its volati and flammability, and because it contributed un sirable qualities to the solution through TOC c centration. It was established that the static syst was more efficient than the continuous f system, but the flow rate must be regulated allow sufficient constant exposure for best resu During the study peroxide was introduced to explosive solution just before treatment. Dur the study peroxide was introduced to the explo solution just before treatment. However, the a tion of small increments on a continuous basis result in greater efficiency with less perox waste. (Davison-IPA)
W79-03026

OZONIZATION OF WATER CONTAIN HUMIC COMPOUNDS, PHENOLS, AND P TICIDES (OZONIROVANIYE VODY, SODE HASHCHEY GUMINOVYE SOYEDINENI FENOLY I PESTITSIDY),
R. D. Gabovich, and I. L. Kurennoy.
Available from the National Technical Informat Service, Springfield, VA 22161 as ADA-038 4 Price codes: A02 in paper copy, A01 in microfic Voprosy Kommunalnoy Gigiyeny, No 6, p 11- 1966. Translated by Army Medical Intelligen and Information Agency, Washington, D.C. Tra lation No USAMIIA-K-4564.

Descriptors: *Ozone, *Water purification, *Chl ination, *Pesticides, *Color reactions, Water an sis, Phenols, Water quality, Sewage treatment, ganic matter, Decomposing organic matter, Hu acids, Degredation, Water pollution treatm Waste water treatment, Water quality, Odor.

Conditions affecting the use of ozone to br down mixtures of humic substances and decolo water, and the use of ozone for breaking do phenols and some pesticides in distilled water s tions and humic solutions were studied. The a tion of ozone to water breaks down humic s stances and the color they impart to the water. amount of ozone required to decolorize the w varied depending on the degree of water chro ticity. The amount of ozone required to dephe lize water was from 0.75 to 2.5 milligrams of oz per milligram of phenol depending on the deg of purification. The effects of ozone on the pe cides, malathion, methylparathion, wofatox, tri lorometaphos, preparation M-81, and dintroort cresol, in distilled water with color added, w studied. It was found that in the deodorization water containing only toxic chemicals, oz worked best in some cases, and chlorine wor best in others. Humic compounds in natural wa did not prevent deodorization, but might req more ozone because decolorization occurs at same time as pesticide breakdown. It is conclu that ozonization and chlorination can be used disinfect sewage containing large amounts of pe cides. (Davison-IPA)
W79-03027

OCEEDINGS OF THE FIFTH NATIONAL MPOSIUM ON FOOD PROCESSING STES.
ific Northwest Environmental Research Lab., rvallis, OR. Industrial Wastes Branch.
ilable from the National Technical Information vice, Springfield, VA 22161 as PB-237 520, ce codes: A15 in paper copy, A01 in microfiche. ort No EPA-660/2-74-058, June 1974. 326 p, ig, 105 tab, 118 ref. Symposium held in Monte- California, April 17-19, 1974.

criptors: *Food processing industry, *Confer- es, *Industrial wastes, *Waste water treatment, aste treatment, Anaerobic digestion, Liquid tes, Water pollution sources, Solid wastes, dge disposal, Effluents, Activated sludge, Bio- radation, Byproducts, Organic wastes, Costs, nomic impact, Land management, Biological tment, Water reuse.

compilation of 18 papers on food processing tes is presented. Topics covered include: land tment of food processing waste water, munici- waste water service charges, use of rotating ogical contactor on meat industry waste ers, waste water reuse, use of ligmosulfonic l for removal of protein and fat from meat ghtering and packing wastes, treatment of rum illery slops, shrimp plant waste water, use of tes as animal feed stock, fishery byproduct ization, pretreatment of vegetable oil refinery tes, economic effects of treating fruit and vege- e processing liquid wastes, and waste water racterization for the specialty food industry. vison-IPA)
9-03031

MPOSTING AT JOHNSON CITY: JOINT EPA-TVA COMPOSTING PROJECT WITH ERATIONAL DATA, 1967-1971. VOLUMES I D II,
vironmental Protection Agency, Washington, . Office of Solid Waste.
primary bibliographic entry see Field 5E.
9-03032

RECYCLED-WATER SANITARY WASTE SPOSAL SYSTEM,
st Virginia Univ., Morgantown.
J. Shoupp.
ailable from the National Technical Information vice, Springfield, VA 22161 as PB-291 740, ce codes: A07 in paper copy, A01 in microfiche. D Dissertation, 1978. 117 p, 18 fig, 9 tab, 106 append. OWRT A-034-WVA(1). 14-34-0001-4.

scriptors: *Aerobic treatment, *Domestic stes, *Microbial degradation, *Microbiology, icroorganisms, *Recycling, *Sewage treatment, aste water treatment, *Water conservation, ater reuse, Bacteria, Methodology, Pathogenic teria, Pollution abatement, Sewage bacteria, atment, Treatment facilities, Waste treatment, ste water(Pollution), Water pollution, Water lamation, Water renovation.

closed, recycled-water sanitary-waste-disposal tem for laboratory study was developed. The tem was based on a 1,000-liter capacity, water- ed biodegradation tank. Two specific environ- ntal variables were studied: organic-loading rate an artificial waste material, based on ground g-food into the system, and aeration rates im- ed on the water column. Two loading rates (2 l 3 persons/day equivalent of sanitary wastes) l two aeration rates (6 and 12 liters/minute) re imposed on the experimental system. Sam- ng of the tank was carried out on a weekly edule by sample withdrawal from ports pene- ting the tank walls. Data were collected and alyzed for the following biological and chemical rameters: total aerobic and anaerobic standard te counts, ATP content, total carbon, inorganic rbon, organic carbon, pH, and dissolved oxygen. addition, the predominant bacterial genera pres- during the stationary stages of the experimental ns were isolated and identified. Data response rves were created to follow the effects on the above parameters of the various regimes of loading and aeration during the relatively longterm (about 130 days) experimental runs.
W79-03034

ANALYSIS OF DIFFERENCES IN MUNICIPAL TREATMENT LEVELS,
Environmental Protection Agency, Washington, DC. Office of Analysis and Evaluation.
J. V. Yance.
Water Resources Research, Vol 14, No 6, p 993-1002, December 1978. 2 fig, 3 tab, 28 ref.

Descriptors: *Waste water(Pollution), *Regression analysis, *Treatment levels, Treatment facilities, Economics, Effects, Programs, Investment, United States, Equations, Costs, Assimilative capacity, Urban development, Systems analysis, Cities.

Effluent charges are often proposed as the best way to insure that environmental costs will be internalized by the discharger. However, even in the absence of such charges, municipal treatment plants have been constructed for many years, an indication that to a significant degree, states and communities have internalized the pollution costs of waste water discharges. The motivation for such investments varies widely, however, since before secondary treatment became a Federal requirement, the percentage of the sewered population in a state receiving such treatment ranged from 9 in New Hampshire to 100 in New Mexico. Using regression techniques, this analysis explains 40-45% of the variation in treatment levels among states in 1968 in terms of factors such as the availability of assimilative capacity relative to waste loads and the recency of urban development. The results of state and local programs appear to have been rational, broadly speaking, more extensive treatment being applied where pollution impacts would be greater. Some of the economic implications of the construction grant program, which provides an added incentive for treatment plant investment, are discussed in the light of these results. (Bell-Cornell)
W79-03079

SERIES INTERMITTENT SAND FILTRATION OF WASTEWATER LAGOON EFFLUENTS,
Utah State Univ., Logan.
D. W. Hill, J. H. Reynolds, D. S. Filip, and E. J. Middlebrooks.
Report PRWR153-1, Utah Water Reseach Laboratory, College of Engineering, Utah State University, Logan, Utah, March 1977. 89p, 12 fig, 56 tab, 87 ref, 2 appen.

Descriptors: *Sands, Filtration, *Wastewater(Pollution), *Lagoons, *Effluents, Water quality, Standards, Treatment facilities, Equations, Design criteria, Economic analysis, Loading rates.

Previous researchers have found single stage intermittent sand filtration to be a feasible and economic means of upgrading wastewater lagoon effluent to meet future standards. However, the major constraint on their use has been the length of the filter runs. Laboratory scale and pilot-scale series intermittent sand filtration of wastewater lagoon effluents has been found to substantially increase the length of the filter runs as well as produce a high quality effluent able to meet future standards. Higher loading rates were found to be possible with series intermittent sand filtration. The operation consistently produced an effluent meeting present Utah 'Class C' water quality standards for BOD, (greater than or equal to 5 mg/1), and the operation also consistently met the 1980 Utah wastewater treatment plant effluent standard for suspended solids (greater than or equal to 10 mg/1). (Bell-Cornell)
W79-03089

CONCENTRATION EFFECTS ON SEPARATION SELECTIVITY IN FOAM FRACTIONATION,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemistry.
E. J. Chou, and Y. Okamoto.
Seperation Science and Technology, Vol. 13, No. 5, p 439-448, 1978. 4 fig, 3 tab, 16 ref.

Descriptors: *Surfactants, *Chelation, *Metals, *Foam fractionation, *Competition, Cadmium, Nickel, Foam separation, Ions, Spectrophotometry, Tensiometers, Surface tension, Waste water treatment, Industrial wastes.

A polyalkylenepolyamine was employed as a chelating surfactant for foam fractionation of metallic ions from aquenous solutions. When 4-dodecyldiethylenetriamine was used as the chelating surfactant, selective removal of Cd(+2), Ni(+2), and Cu(+2) form aquenous solution was a function of the metal and surfactant concentrations. A deionized metal-bearing solution with an adjusted pH was mixed with the surfactant in a separation unit; water-saturated compressed air was bubbled through the solution. Metal concentraions in the foamate and residue were measured by atomic absorption spectrophotometry; surface tensions were calculated with a tensiometer. When the surfactant concentration exceeded the total metallic ion concentration in solution, Ni(+2) complexed with the surfactant more readily than Cu(+2), indicating that Ni(+2) was selectively removed during foaming. The reverse was found true when the metallic ion concentration was increased. Cu(+2) completed more readily for surfactant complex formation; bubbles enhanced Cu(+2) removal. Ni(+2) and Cd(+2) were no as readily removed under higher ionic conentrations. In solutions containing Cd(+2), Cu(+2), and Ni(+2) with higher total concentrations that the chelating agent, the order of selective removal was Cu(+2) > Ni(+2) > Cd(+2). When the surfactant concentration increased, the removal order was reversed to Cd(+2) > Ni(+2) > Cu(+2). (Lisk-FIRL)
W79-03096

THE EFFECT OF TEMPERATURE CONTROL ON BIOLOGICAL WASTEWATER TREATMENT PROCESSES,
Purdue Univ., Lafayette, IN. School of Mechanical Engineering.
C. E. Collins, F. P. Incropera, and C. P. Grady, Jr.
Water Research 1978, Vol. 12, p. 547-554, 9 fig, 33 ref. OWRT A-042-IND (5).

Descriptors: *Waste water treatment, *Biological treatment, *Temperature, Activated sludge, *Waste treatment, Sludge treatment, Mathematical model, Solids retention time.

A model has been developed to simulate the effect of temperature control on the performance of a completely mixed activated sludge wastewater treatment system. From calculations based on the model it is demonstrated that effluent quality is significantly improved for any increase in temperature from 10 degrees to 30 degrees C, irrespective of solids retention time (SRT) and sludge settling characteristics. A trade-off exists conerning the effects of temperature on the sludge disposal and oxygen requirements of the system. Although any increase in temperature above 20 degrees C will significantly reduce the sludge production rate, it will also contribute to increased air flow power requirements. The results suggest that a suitable compromise may be reached with a temperature between 23 and 27 degrees C and an SRT between 8 and 14 days.
W79-03110

KINETICS OF WET OXIDATION OF NYLON 66,
Connecticut Univ., Storrs. Dept. of Chemical Engineering.
D. W. Sundstrom, A. J. Luciano, and H. E. Klei.
Journal of Applied Polymer Science, Vol. 20, p 207-216, 1976. 7 fig, 9 ref. OWRT A-019-CONN(3), OWRT 14-01-0001-1075.

Descriptors: *Waste disposal, *Oxidation, *Polymers, *Degradation(Decomposition), Activation energy, Temperature, Mass transfer, *Polymer waste degradation, *Aqueous phase oxidation,

*Wet oxidation, *Nylon 66, *Reaction kinetics, *Rotating disc geometry, Dissolved oxygen concentration.

The kinetics of the aqueous phase oxidation of nylon 66 was studied at temperatures up to 190C. The nylon 66, in the form of a cylindrical disc, was attached to the shaft of a variable-speed drive inside the reactor. With a rotating disc geometry, the chemical kinetics of the surface reaction can be separated from the mass transfer effects. By measuring the reaction rates at different temperatures, pressures and disc rotational speeds, a kinetic rate expression was developed relating nylon degradation to dissolved oxygen concentration and temperature. The order of reaction with respect to dissolved oxygen concentration was 0.6, and the activation energy was 42 kcal/g-mole. (de Lara-Conn)
W79-03125

NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,
Nova Scotia Technical Coll., Halifax. Dept. of Bio-Resources Engineering.
K. V. Lo, and J. T. Clayton.
Canadian Agricultural Engineering, Vol. 20, No. 1, June 1978. p 64-69. 3 fig, 8 tab, 7 ref.

Descriptors: *Nutrient removal, *Soils, *Land treatment, *Land application, *Waste water treatment, *Phosphates, *Nitrogen, *Denitrification, *Water purification, Effluents, Ammonia, Hydrogen ion concentration, Soil contamination, Ninigrit sandy load, Hinckley sand, Canada, Water quality standards, Soil columns, Absorption, Water reuse, Potable water.

Soil columns of Ninigrit sandy loam and Hinckley sand were used to study effects of effluent application rate and frequency on wastewater renovation through soil media. Attempts were also made to determine nutrient absorptive properties of Ninigrit sandy loam; under eqilibrium batch conditions, ammonia absorption on the soil can be expressed by the Freundlich absorption isotherm. In pH ranges common to wastewaters (about 7.0) nitrate absorption on the soil was insignificant. Column test resuls showed that all soil columns removed 99% or more phosphate; phosphate from the secondary effluent applied accumulated in the top 2.5-5.0 cm of the soil columns, depending on loading. At the end of the 12-week test period, nitrogen concentrations in all filtrates achieved the Canadian drinking water standard of 10 ppm nitrate-nitrogen. Columns with five cm/wk application had the best nitrogen removal, about 80%. Columns with 10 and 20 cm/wk application rates had nitrogen removals ranging 63-74%. If crops were incorporated into the system, nitrogen removal efficiency would probably be higher. Tests results also showed that denitrification could have been significant in nitrogen removal. Total nitrogen loss in the soil columns amounted to about 65-80% of the nitrogen input from wastewater, a portion of which must be due to denitrification. (Lynch-Wisconsin)
W79-03178

THE FATE OF NON-COMPLIANT MUNICIPALITIES WITH REGARD TO THE SECONDARY TREATMENT STANDARDS PURSUANT TO THE 1972 FEDERAL WATER POLLUTANT CONTROL ACT AMENDMENTS - A PROBLEM OF ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W79-03208

INACTIVE AND ABANDONED UNDERGROUND MINES. WATER POLLUTION PREVENTION AND CONTROL,
Baker (Michael), Jr., Inc., Beaver, PA.
For primary bibliographic entry see Field 5G.
W79-03247

RECYCLING ZINC IN VISCOSE RAYON PLANTS BY TWO STAGE PRECIPITATION,
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 136, Price Codes: A02 in paper copy, A01 in microfiche. Report No. EPA-625/2-73-001a, December 1972. 12 p, 6 fig, 3 tab.

Descriptors: *Waste treatment, *Recycling, *Zinc, Industrial wastes, Water pollution sources, Separation techniques, Neutralization, Cost-benefit analysis, Economics, Viscose rayon industry, Sludge, Textiles, Chemical precipitation.

A method for recovering zinc in rayon process sludge was proven. The recovered zinc, recycled to the rayon manufacturing plant, showed no adverse effects on the rayon yarn. The zinc recovery process involves two stage precipitation with the second precipitation under careful pH control using sodium hydroxide in a circulating slurry of zinc hydroxide crystals. This recovery system enhances the economics of zinc pollution control; allows neutralization of the acid stream; and the recovery of the zinc results in a profit for industrial yarns and a moderate cost for textile yarns. (Davison-IPA).
W79-03249

FEDERAL GUIDELINES: PRETREATMENT OF POLLUTANTS INTRODUCED INTO PUBLICLY OWNED TREATMENT WORKS,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
October 1973. 160 p, 45 tab, 94 ref, 4 append.

Descriptors: *Waste water treatment, *Pretreatment(Water), Publications, *Federal Water Pollution Control Act, Industrial wastes, Municipal wastes, Treatment facilities, Effluents, Water pollution treatment, Water pollution control, Pollutant identification, Biochemical oxygen demand, Phosphorus, Phosphorus compounds, Nitrogen, Nitrogen compounds, Legislation, Regulation.

The Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) requires the promulgation of guidelines for the pretreatment of waste waters to be discharged to publicly owned treatment works. The relationship between pretreatment and the effluent limitations is distinguished. Information is presented on effluent limitations for National Pollutant Discharge Elimination Systems (NPDES) municipal permit; effluent limitations for publicly owned treatment works; and joint treatment and pretreatment. Basic pretreatment policy considerations for the development of these guidelines include: joint treatment, where it is economical; in-plant measures for reducing the quantity and strength of industrial waste waters; pretreatment to remove compatible pollutants is not required by the Federal standards; and state and municipal pretreatment requirements should be tailored to the specific limitations of the individual treatment works. Federal, state and local pretreatment standards are discussed. Appendix D identifies waste water characteristics and pretreatment unit operations for 22 industrial groups. (Davison-IPA)
W79-03250

CONSTRUCTION GRANTS PROGRAM INFORMATION: INDUSTRIAL COST RECOVERY SYSTEMS,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-03252

WASTE CLEARINGHOUSE AND EXCHANGES: NEW WAYS FOR IDENTIFYING AND TRANSFERRING REUSABLE INDUSTRIAL PROCESS WASTES,
Little (Arthur D.), Inc., Cambridge, MA.
R. C. Terry, Jr., J. B. Berkowitz, C. M. Mohr, J. P. Tratnyek, and J. T. Funkhouser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 287, Price codes: A07 in paper copy, A01 in microfiche. Final Report No. 3, SW-130c and C-78494, October 1976. 147 p, 9 fig, 21 tab, 22 ref, 6 append. 6[illegible] 01-3241.

Descriptors: *Waste disposal, *Waste treatmen *Recycling, Waste identification, Chemical waste Industrial wastes, Solid wastes, Liquid waste Legal aspects, Financing, Transfer, Informatio exchange, Data collection, Marketing.

An assessment of the feasibility and potenti impact of transferring wastes in the U.S. is repor ed, and guidelines for organizing and operating waste transfer organization are provided. From a investigation of existing European 'waste e changes' it was determined that there are tw types of transfer agents: (1) the informatio clearinghouse which transfers information onl and (2) the materials exchange which accepts res dues, analyzes them, identifies new uses, render necessary treatment, and actively seeks buyer Concepts and requirements for transferring wast are analyzed; a distinction is made between 'tras waste,' which has no reuse value, and 'scra waste,' which can be reused. Quantities of industr al process wastes suitable for transfer are estimate for the Philadelphia Standard Metropolitan Stati tical Area. Industries manufacturing chemicals using chemicals as raw materials produces wast suitable for transfer services. These industry type are: pharmaceuticals; paint and allied product organic and chemicals; petroleum refining; an small industry machinery. Industries with a nee for fuels or cleaning solvents are potential users scrap wastes. The techniques and procedures fo successful transfer of reusable wastes are examine Financial and legal aspects for these organizatio are discussed. (Davison-IPA)
W79-03254

A STUDY OF COAL-ASSOCIATED WASTE RESULTING FROM THE MINING, PROCESSING AND UTILIZATION OF COAL,
West Virginia Univ., Morgantown. Coal Researc Bureau.
For primary bibliographic entry see Field 5C
W79-03255

METHANOL TREATED ACTIVATED SLUDG AS AN AGRICULTURAL CHEMICAL CARR ER,
Department of Agriculture, Washington, DC.
For primary bibliographic entry see Field 5C
W79-03262

GUIDANCE FOR PREPARING A FACILIT PLAN, MUNICIPAL WASTEWATER TREA MENT WORKS, CONSTRUCTION GRANT PROGRAM,
Environmental Protection Agency, Washingto DC. Municipal Construction Div.
For primary bibliographic entry see Field 5C
W79-03263

DEVELOPMENT OF AN ON-LINE ORGANI ANALYZER FOR THE MUST WATER PRO ESSING ELEMENT,
Abcor, Inc., Wilmington, MA. Walden Div.
For primary bibliographic entry see Field 5A.
W79-03264

ALTERNATIVE INSTITUTIONAL AND F NANCIAL ARRANGEMENTS FOR AREAWID WASTE TREATMENT MANAGEMENT,
Banks (Harvey O.) Consulting Engineer, Inc., Be mont, CA.
For primary bibliographic entry see Field 5C
W79-03265

WASTEWATER TREATMENT TECHNOLOG DOCUMENTATION FOR ALDRIN/DIELDRI MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, an G. L. Kelso.
Available from the National Technical Informatio Service, Springfield, VA 22161 as PB-254 01

e Codes: A03 in paper copy, A01 in micro-
e. Final Report Nos. EPA-440/9-76-007 and
I-4127-C, February 6, 1976. 46 p, 2 fig, 2 tab,
ef, 1 append. 68-01-3524.

criptors: *Waste water treatment, *Industrial
tes, *Aldrin, *Dieldrin, Cost analysis, Cost
parisons, Documentation, Evaporation, Waste
er disposal.

nough the pesticides, aldrin and dieldrin, are
currently manufactured in the U.S., recent
nts concerning the pesticides are presented,
ufacturing processes are reviewed and in-plant
trols are described. Shell Chemical Co., was
nerly the sole U.S. manufacturer of aldrin and
drin and used a waste water disposal system
consisted of a 100-acre asphalt-lined evapora-
basin located on the Denver, Colorado, plant
unds. If production were resumed at the Shell
lity, this system is considered adequate to
ieve zero discharge of any waste generated.
e a limited market for aldrin may continue to
t in the future there is a possibility that Shell
reopen the Denver plant or construct a new
nt or that another company may consider manu-
uring aldrin. Considering this, the design of an
poration pond for waste water disposal at a
aldrin manufacturing plant and related costs
examined. (Gibson-IPA).
9-03267

ACTIVATED CARBON TREATMENT STEM (ACTS) FOR SEWAGE,
Propulsion Lab., Pasadena, CA.
E. Lewis, J. J. Kalvinskas, and W. Howard.
ailable from the National Technical Information
vice, Springfield, VA 22161 as N76-20697,
e Codes: A06 in paper copy, A01 in micro-
e. Report No. NASA-CR-146572, February 10,
6. Presented at California Water Pollution Con-
Association Northern Regional Conference,
kton, October 10, 1975. 30 p, 4 fig, 21 tab, 3
NAS7-100.

scriptors: *Waste treatments, *Municipal
tes, *Sewage treatment, *Activated carbon,
ivated sludge, Sewage, Filtration, Dewatering,
dge treatment, Treatment facilities, Sludge dis-
al, Pilot plants, Estimated costs, Orange
nty Sanitation District, California, Laboratory
ing.

e development of an Activated Carbon Treat-
nt System (ACTS) for municipal sewage is dis-
sed. Initial work included laboratory testing
research, development of a 10,000 gallon/day
nonstration plant, and pilot plant equipment
s. Procedures involved in the ACTS sewage
eration include: carbon-sewage treatment, pri-
y and secondary clarifiers, gravity (multi-
dia) filter, filter press dewatering, flash drying
carbon-sewage filter cake, and sludge pyrolysis
activation. Construction of the 1 million
lon/day pilot plant at Orange County Sanitation
trict employing this system was expected to be
npleted by February 1976. Preliminary econom-
estimates indicate that this process provides a
ital cost savings up to 25% over competitive
vage treatment in meeting projected ocean dis-
rge standards. (Davison-IPA).
9-03268

STRUCTION OF POLYCHLORINATED BI-ENYLS IN SEWAGE SLUDGE DURING IN-NERATION,
rsar, Inc., Springfield, VA.
r primary bibliographic entry see Field 5E.
9-03269

WHAT WAY IS WATER POLLUTION IN-UENCED BY SEWERAGE SYSTEMS,
IV Consulting Engineers, Amersfoort
etherlands).c
r primary bibliographic entry see Field 5B.
9-03298

WASTEWATER REUSE BY BIOLOGICAL-CHEMICAL TREATMENT AND GROUND-WATER RECHARGE,
Water Planning for Israel Ltd., Tel-Aviv. Dept. of Sewage Reclamation.
E. Idelovitch.
Journal of the Water Pollution Control Federation, Vol. 50, No. 12, p 2723-2739, December 1978. 10 fig, 4 tab, 33 ref.

Descriptors: *Water reuse, *Groundwater recharge, *Waste water treatment, Water treatment, Groundwater, Recharge, Treatment, Irrigation, Projects, Municipal wastes, Sewage, Water quality, Potable water, Wells, Water wells, *Israel, Nonpotable reuse.

The approach of indirect nonpotable reuse of municipal wastewater, after biological-chemical treatment and groundwater recharge, was adopted in Israel for the Dan Region Project--Stage I. Its implementation involves conversion of the country's southern water supply and nonpotable water, mainly for irrigation. Chemical treatment, consisting of the high lime-magnesium process followed by detention of the effluent in polishing ponds (primarily for ammonia stripping and recarbonation), efficiently removes phosphorus, ammonia and total nitrogen, organics, trace elements including boron and fluorides, and bacteria and viruses from oxidation pond effluent. The removal efficiency of the process is higher in summer than in winter. Groundwater recharge provides for seasonal storage, additional purification of the effluent by a variety of processes taking place in the soil and in the aquifer, and dilution with high-quality natural groundwater. The reclaimed water fulfills the quality requirements of unrestricted crop irrigation and of a wide variety of industrial uses; it also satisfies most of the requirements of prevailing drinking water standards. (Sims-ISWS)
W79-03305

CONTINUOUS SEWAGE SLUDGE HEAT TREATMENT APPARATUS,
G. Nakamura.
U.S. Patent No. 4, 110,217, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 973, no 5, p 2312, August 29, 1978.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Sewage disposal, Sludge treatment, Steam, Heat treatmeent, Eqlipment.

A sewage disposal apparatus is described for continuous heat treatment of sludge delivered from the final settling tank of a sewage disposal system on a large industrial scale. The object of the invention is to treat sludge with steam of relatively low pressure and temperature without requiring a substantially long period of aging. Since the treatment is run continuously it requires a smaller sized vessel. The apparatus has an axially porous member within a vertical vessel and radial apertures in the side wall of the vessel so that almost all of the sludge is exposed to and thus heated with steam supplied through the radial apertures. The sludge is fed into the head of the vessel and falls down in the form of thin strings through axial pores and hits the tail of the vessel. (Sinha - OEIS)
W79-03310

NOZZLE FOR ROTARY FILTER PIPE,
For primary bibliographic entry see Field 5F.
W79-03315

METHOD OF IMPROVING THE BACKWASHING OF FIXED BEDS FORMED OF GRANULAR MATERIALS,
Sulzer Bros. Ltd., Winterthur (Switzerland). (Assignee).
I. Sekoulov, and W. R. Muller.
U.S. Patent No. 4,113,612, 7 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 932, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Activated carbon, Adsorption, Filtration, Equipment, Gases, *Backwashing.

A method improves the backwashing of fixed beds formed of granular materials and used during waste water purification or water treatment. The fixed bed, during the course of the backwashing is maintained during a predetermined time duration filled with a quiescent liquid. This liquid contains at least one substance which is distributed as uniformly as possible. In the presence of a spontaneous, catalytically triggered decomposition reaction, this substance releases a gaseous component. Then, the fixed bed is backwashed with water. (Sinha - OEIS)
W79-03316

METHOD FOR OBTAINING SUBSTANTIALLY COMPLETE REMOVAL OF PHENOLS FROM WA STE WATER,
Exxon Research and Engineering Co., Linden, NJ. (Assignee).
M. L. Gorbaty.
U.S. Patent No. 4,113,615, 11 p, 2 fig, 7 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 933, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Organic wastes, *Phenols, Adsorption, Hydrogen ion concentration, Coal, Char, Coal gasification plants.

Substantially complete removal from waste water of phenols and other organic compounds that dissociate in solution to produce organic anions and hydrogen ions can be obtained by contacting the waste water with char derived from a carbonaceous material whose ash contains a total of at least 15 weight percent calcium, magnesium, potassium and sodium expressed as oxides on a moisture free basis. The pH of the resultant slurry is maintained at a value such that the ratio of the highest dissociation constant of the organic compounds present to the hydrogen ion concentration of the slurry is less than about 0.1, and purified waste water is recovered. The char suitable for use as the adsorbent may be any carbonaceous product resulting from the partial thermal process of coal or other carbonaceous material. The material may be obtained from the carbonization, gasification, pyrolysis or liquefaction of coal. It is particularly advantageous to use char fines carried overhead with the product gas produced in a fluid bed gasifier as the adsorbent. Such utilization of the unconverted carbon in the fines enhances the economics of both the gasification process and the waste water treating process. (Sinha - OEIS)
W79-03317

BRINE PURIFICATION PROCESS,
Allied Chemical Corp., Morristown, NJ. (Assignee).
A. B. Gancy, and C. J. Kaminski.
U.S. Patent No. 4,115,219, 8 p, 1 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1473, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Chemical wastes, Separation techniques, Chemical precipitation, *Brines, Water quality control, Product recovery.

An improved process for the purification of raw sodium chloride brines containing dissolved impurities including strontium, calcium and magnesium comprises (a) contacting the raw brine with sodium carbonate and solids recycled from step (d) for formation of strontium carbonate and calcium carbonate solids, (b) contacting the treated brine containing the carbonate solids with sodium hydroxide for formation of magnesium hydroxide solids, (c) removing a major portion of the strontium carbonate, calcium carbonate and magnesium hydroxide solids to provide a purified effluent and (d) recycling a portion of removed solids for admixture with the raw brine and sodium carbonate in the first step. (Sinha - OEIS)
W79-03319

TREATMENT OF AQUEOUS DISPERSIONS,
Monsanto Co., St. Louis, MO. (Assignee).
E. J. Griffith.
U.S. Patent No. 4,115,233, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1477, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water quality control, Industrial wastes, Electrodes, Cathodes, Anodes, Zeta potential, Equipment, Electroendosmosis, Zonal concentration.

In many industrial processes, aqueous dispersions of solids are obtained as waste streams. Such waste streams often cannot be conveniently disposed of due to materials handling difficulties or ecological or safety considerations and are retains in large ponds, holding tanks, or other containment means. However, in the case of many aqueous dispersions, zonal concentration of the solids by settling takes place at an extremely low rate, if at all. This invention provides a process for increasing the rate of zonal concentration. A cathod is placed intermediate between a first cathode and anode. A direct current electrical potential is provided so that electroendosmosis may be used to increase the density of solids within the aqueous dispersion. The process and apparatus are for use on large impoundments (greater than 100 sq. m area). (Sinha - OEIS)
W79-03320

TREATMENT OF SEWAGE,
K. C. Smith, and M. E. Garrett.
U.S. Patent No. 4,115,258, 6 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1485, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Oxygen, *Oxidation, Biochemical oxygen demand, Hydrogen sulfide, Sewage.

Pure oxygen or a gas containing substantially more oxygen than air is injected under pressure into sewage held in or flowing through a rising or pumping sewer. This injection may be used to prevent the concentration of dissolved oxygen in the sewer falling to a level at which there occurs bacterial reduction to hydrogen sulphide of sulphate present in the sewage and/or to reduce the Biochemical Oxygen Demand of the sewage. The injection can also be used to oxidize to sulphur and sulphide dissolved in the sewage. The pure oxygen or the gas containing more oxygen than air may be injected into sewage flowing through a sewage pipe forming part of a rising or pumping sewer, into a pump used to transfer the sewage through the sewer, or into a part of the sewer (e.g. a sump) where sewage is collected before being transferred through the sewer. (Sinha - OEIS)
W79-03321

SELECTIVE REMOVAL OF IRON CYANIDE ANIONS FROM FLUIDS CONTAINING THIOCYANATES,
Rohm and Haas Co., Philadelphia, PA. (Assignee).
N. L. Avery.
U.S. Patent No. 4,115,260, 7 p, 2 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1486, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Separation techniques, Ion exchange, Anion exchange, Inorganic compounds, Resins, Regeneration, *Cyanides.

The process of this invention comprises (a) contacting an aqueous fluid containing iron cyanide complex anions and other common ions including thiocyanate ions with a strongly basic, acrylic-based anion exchange resin to remove the iron cyanide complex anions from the fluid, (b) separating the resin containing the bound iron cyanide complex anions from the treated fluid containing the tiocyanate and other common ions, (c) regenerating the resin by contacting it with a brine solution to replace the adsorbed iron cyanide complex anions, (d) separating the spent regenerant containing the iron cyanide complex anions from the regenerated resin, which is now ready for re-use, and (e) where the resin particles form a bed or mass through which the treated fluid and regenerant flow, separating that portion of the regenerant which elutes later, and re-using the late-eluting portion without further treatment to regenerate spent resin. (Sinha - OEIS)
W79-03322

PROCESS FOR TREATING DRINKING WATER AND SEWAGE,
For primary bibliographic entry see Field 5F.
W79-03323

METHOD OF PURIFYING POLLUTED WATER,
Phillips Petroleum Co., Bartlesville, OK. (Assignee).
W. C. McCarthy, and R. O. Dunn.
U.S. Patent No. 4,115,264, 6 p, 1 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 1974, no 3, p 1487, September 19,78.

Descriptors: *Patents, Water pollution treatment, *Waste water treatment, *Organic wastes, Water purification, *Oxidation, Catalysts, Alkali metals, Catalytic oxidation.

This invention provides an improved process for the catalytic oxidative purification of organically polluted waters. The life of a catalyst employed in the catalytic oxidation of organically polluted waters containing negligible amounts of alkali metal is extended by increasing the alkali metal concentration prior to subjecting the water to the catalytic oxidation. This invention is generally applicable to any aqueous phase and the catalyst and process conditions employed are those known in the art. (Sinha - OEIS)
W79-03324

WASTE WATER TREATMENT ROTOR,
C. P. Thissen.
U.S. Patent No. 4,115,268, 8 p, 10 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, No. 3, p. 1488, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Biological treatment, Equipment, Aeration, Aerobic conditions, Slime, *Biochemical oxygen demand.

The biological treatment of waste water for the removal of BOD involves the use of one or more partially submerged bodies forcibly rotated to expose the organisms on the contact surfaces to the atmosphere for the absorption of oxygen. The growth of the biological slimes on the surfaces of the rotating contactor is thereby encouraged. The lower half of the rotor is immersed in the waste water and the upper half is out of the waste water and exposed to the air. This invention incorporates in the biological treatment rotor, a stiff laminar or sheet material of an inert plastic material such as polyethylene which is provided with a multiplicity of irregularities or cup-like recesses spread substantially over its face. The sheet material is wrapped sprially around a central shaft so that there is a substantial number of flow passages for waste water and air in directions parallel to the axis and also around the periphery. Overall, the rotor is generally cylindrically shaped and the multiplicity of convolutions of the sheet material are maintained in spaced relation by the cup-shaped recesses. (Sinha - OEIS)
W79-03325

METHOD FOR RECOVERING VARIABLE-VALENCY ELEMENTS AND PURIFYING SEWAGE WATERS,
Anic S.p.A., Palermo (Italy). (Assignee).
G. Generini.
U.S. Patent No. 4, 116, 783, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 974, no 4, p 2015, September 26, 1978.

Descriptors: *Patents, *Waste water treatme *Sewage treatment, *Separation techniques, Hea metals, Oxidation, Reduction(Chemical), Ele trolysis, *Metals, Ore treatment plants, Vanadiu Product recovery.

A method for stripping pollutant metals fr sewage waters from ore-treatment installations disclosed, which comprises the step of using, i short-circuited electrode system through whi the waters to be purified are flowed, a compou of an element which is other than the catho metal and is more electro-positive than the ano element. Striking results are obtained by treati vanadium-containing sewage waters from galliu ore treatment plants with silver sulfate in a copp iron electrode system. The method can be e ployed to recover other transition metals fr liquors which contain them. (Sinha - OEIS)
W79-03330

WATER PURIFICATION METHODS,
International Telephone and Telegraphy Cor Nutley, NJ. (Assignee).
For primary bibliographic entry see Field 5F.
W79-03331

APPARATUS FOR INCREASING THE PH O WASTE WATER,
Mine Safety Appliances Co., Pittsburgh, PA. (A signee).
E. C. King.
U.S. Patent No. 4,116,834, 4 p, 3 fig, 4 ref; Offic Gazette of the United States Patent Office, V 974, No 4, p 2031, September 26, 1978.

Descriptors: *Patents, *Waste water treatme *Acid mine water, *Water pollution treatme *Hydrogen ion concentration, Lime, Mixin Equipment, Sensors.

There are situations in which it is desirable to tr waste water in order to increase its pH and to ho it at a predetermined value. For example, it desirable to neutralize acid mine drainage in th way. The object of this invention is to provide apparatus which is relatively simple in desig Lime from a hopper is fed to a lime slurry tank a variable speed feeder. The tank receives wa from a conduit in which there is a throttle val and a flowmeter. Slurry from the tank is deliver to a mixing tank that has an inlet for untreat waste water and an outlet for treated waste wat A sensor responsive to the pH of treated wa water leaving the mixing tank controls a device f operating the throttle valve, and the flowmet controls a device for operating the lime feeder keep the concentration in the slurry tank substa tially constant regardless of the rate of flow out that tank. (Sinha-OEIS)
W79-03333

BIOLOGICAL NITRIFICATION AND DEN TRIFICATION USING ROTATING BIOLOG CAL CONTACTORS,
Northeastern Univ., Boston, MA. Dept. of Ci Engineering.
J. C. O'Shaughnessy, F. C. Blanc, P. Brooks, D. Connick, and A. Silbovitz.
Massachusetts Water Resources Research Cent University of Massachusetts, Amherst, WRR Publication No. 97, July 1978. 107 p, 32 fig, 9 tab, ref, 4 append. OWRT A-085-MASS(1), 14-3 0001-6022, 14-24-0001-7046.

Descriptors: *Biological treatment, *Denitrific tion, *Nitrification, *Waste water treatment, Aer bic bacteria, *Rotating biological contactors.

This study evaluated the ability of Rotating Bi logical Contactors (RBC) to provide biologic nitrification and denitrification of secondary tre ed domestic wastewater. The study involved bo bench scale and pilot scale testing. The resu indicated that the ammonia nitrogen applicatio rate and volume to surface ratio of the unit a major design parameters to achieve proper nitri cation with RBC units. Ninety four percent amm nia conversion was observed for an ammonia loa

rate of 0.20 lbs. NH3-N/1 1000ft2-day. In order achieve a high degree of nitrification, a minim of two stages should be used in RBC unit ign, and supplemental alkalinity addition may required. The denitrification study indicated t RBC units can be used to achieve biological itrification of domestic wastewater. (Godfrey-ss)
79-03383

RIFICATION OF PAPER-MILL WASTE ATERS WITH MODERN DEVICES (PAPIR-ARI SZENNYVIZEK TISZTITASA KORS-RU BERENDEZESEKKEL),
piripari Vallalat Kutato- es Fejlesztointezete, dapest (Hungary).
Ligeti.
piripar, Vol. 22, No. 3, p 93-100, 1978. 3 fig, 14 3 tab.

scriptors: *Pulp wastes, *Waste water treatnt, Costs, Economics, Industrial water, Wastes, lustrial wastes, Waste treatment, Water pollun treatment, Water pollution sources, Pulp and per industry, Effluents, Water purification, Amization, White water(Paper machines), Closed tems, Water reuse.

e suitability of the Float Wash and Bauer Hysieve devices for treatment of high-solids paper chine white waters in closed-circuit paper mills s investigated. Despite their different operating nciples, both devices were found suitable for nomical effluent purification; the Hydrasieve med better suited for cleaning suspensions with her solids contents (long fibers and fiber buns), while the Float Wash apparatus seemed re adequate for lower-solids paper machine ite waters. The clarified water should, however, subjected to a second purification stage before ng recirculated for reuse. Depending on the ality and volume of white water to be treated, h devices can be amortized within 2-4.5 years. rown-IPC)
79-03384

IE CLOSED-CYCLE BLEACHED KRAFT LP MILL,
E and K, Inc., Birmingham, AL.
r primary bibliographic entry see Field 3E.
79-03385

NETICS FOR ACTIVATED SLUDGE PROCS DESIGN: EXPERIMENTAL APPLICAON TO STRAW PAPER WASTEWATER EATMENT,
enoa Univ. (Italy). Tecnologie dell Ingegneria imica; and Genoa Univ. (Italy). Ist. di Scienze. Del Borghi, G. Migliorini, G. Isola, and G. rraiolo.
otechnology and Bioengineering, Vol. 20, No. 2, 203-215, February, 1978. 11 fig, 20 ref, 2 tab.

escriptors: *Pulp wastes, *Waste water treatnt, *Activated sludge, *Kinetics, Wastes, Waste atment, Water pollution treatment, Water pollun sources, Pulp and paper industry, Effluents, odel studies, Industrial wastes, Microbial degrtion, Design, Straw paper.

egradation kinetics for the treatment of straw per waste water in an activated sludge process e studied and a kinetic model is derived for both tch and continuous experiments. These two ethods are reasonably equivalent only when ther low concentrations of substrate are inlved. Both models, however, show a depennce upon concentration corresponding to that nich is typical of multicomponent substrate degdation. The kinetic model derived from continus tests appears to be more suitable for designing dustrial processes in that it avoids oversizing of e aeration unit. (Swichtenberg-IPC)
79-03386

NE MILL'S APPROACH TO EFFLUENT EATMENT,
owater Scott Corp. Ltd., Northfleet (England).
T. Winship.
In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper No. 17, 10 p. 3 fig.

Descriptors: *Waste water treatment, *Pulp and paper industry, *England, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp wastes, Foreign countries, Screens, Fiber recovery, Flocculation, Activated sludge, Polyelectrolytes, Water reuse, Recycling, Water conservation, Water consumption(Except consumptive use), Industrial water, Aluminum sulfate.

Effluent treatment at the creped-paper mill of Bowater Scott Corp. Ltd. (United Kingdom) consists of Kenfil inclined screens for fiber recovery and Ceca-Wabag contact flocculators to remove fines from the effluent streams in the presence of alum, polyelectrolytes, and activated sludge. The supernatant from the flocculators is pumped back to the paper mill for reuse by the Yankee tissue machines. Fresh water consumption and total fiber loss have been reduced by about 45 and 70%, respectively. (Swichtenberg-IPC)
W79-03391

NEW PROCESS FOR TREATING BLEACHING EFFLUENTS FROM CHEMICAL PULP MILLS (NOUVEAU PROCEDE DE TRAITEMENT DES EFFLUENTS DE BLANCHIMENT DES USINES DE PATES CHIMIQUES),
Centre Technique de l'Industrie des Papiers, Cartons et Celluloses, Grenoble (France).
M. Pichon, E. Muratore, and P. Monzie.
French Patent No. 2,365,523. April 21, 1978. 13 p, 1 fig, 7 claims.

Descriptors: *Bleaching wastes, *Waste water treatment, *Decoloring, *Patents, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Pulp wastes, Lignins, Chlorides, Color, Waste dilution, Organic compounds, Ultrafiltration, Corrosion, Heat balance, Kraft mills.

Bleach plant effluents from kraft pulp mills containing in solution organic colored materials stemming especially from lignin and its degradation products on one hand and mineral chlorides in significant quantities on the other hand are subjected to decoloring with separation of the colored organic materials in a concentrated form. This is followed by aqueous dilution of the separated colored organic concentrate, preferably using an effluent poor in aqueous chlorides. The diluted concentrate is then subjected to ultrafiltration to obtain a final concentrate with a mineral chloride content low enough to be recycled for heat recovery without risk of excessive corrosion. (Speckhard-IPC)
W79-03394

PROCESS FOR TREATING MATERIALS SUCH AS COMBUSTIBLE SLUDGES IN A FLUIDIZED-BED REACTOR (PROCEDE DE TRAITEMENT DE MATIERES, TELLES QUE NOTAMMENT DES BOUES COMBUSTIBLES, DANS UN REACTEUR A LIT FLUIDISE).
Ahlstrom (A.) Osakeyhtio, Helsinki (Finland).
For primary bibliographic entry see Field 5E.
W79-03395

POSSIBLE USE OF ELECTROCHEMICAL COAGULATION FOR PURIFICATION OF KRAFT MILL EFFLUENTS (O VOZMOZHNOSTI PRIMENENIYA METODA ELEKTROKHIMICHESKOI KOAGULYTSII DLYA OCHISTKI STOCHNYKH VOD SULF'FAT-TSELLYULOZNOGO PROIZVODSTVA),
G. R. Bochkarev, V. A. Babkin, V. Ya. Fedosova, M. I. Anisimova, and E. N. Serdobol'skii.
Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSR, Seriya Khimicheskikh Nauk No. 1, p 148-150, January, 1978. 1 fig, 4 ref, 1 tab.

Descriptors: *Pulp wastes, *Electrochemistry, *Coagulation, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Electrodes, Steel, Anodes, Electric currents, Carbon, Iron, Phenols, Hydrogen ion concentration, Bleaching wastes, Color, Chemical oxygen demand, Effluents, Pulp and paper industry, Kraft mills.

Electrochemical coagulation of kraft mill effluents based on the formation of metal hydroxides during anodic dissolution of metal electrodes was investigated. Rectangular steel electrodes with a working surface of 1.0-3.4 sq um served as anodes, using a current flow of 100-300 amp-hr/cu m. Purification effectiveness was evaluated by changes in the carbon, iron, and phenol contents and COD measurements before and after purification. The effect of pH on the degree of purification depended on the nature of the effluent. Optimum pH for the purification of effluents from the first alkaline extraction stage after chlorination was 11.5. Other effluents were satisfactorily purified at pH 4.5-7.0. Tabulated data indicated that the carbon content, color, and COD of the effluents were reduced by 70-90%. Phenol content was reduced by 50-60%. Use of electrochemical coagulation for purification of heavily contaminated effluents can reduce the load on biological purification and simplify it. (Chern-IPC)
W79-03396

A FOAM ACTIVATED SLUDGE PROCESS FOR THE TREATMENT OF SPENT SULFITE LIQUOR,
University of Western Ontario, London.
J. E. Zajic, M. A. Hill, D. F. Manchester, and K. Muzika.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 884-895, May, 1978. 13 fig, 5 ref, 3 tab.

Descriptors: *Sulfite liquors, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Pulp wastes, Flotation, Foaming, Biocheical oxygen demand, Biological treatment, Operation and maintenance, Biodegradation, Sludge, Pilot plants, Spent sulfite liquor.

A foam flotation activated sludge process was developed for the biodegradation of spent sulfite liquor, which removed 85% of the BOD from concentrated pulp mill waste having a pretreatment BOD level of 24,000 mg/liter. It is based on an autolytic culture system. The process has no sludge wastage requirement in the autolytic model associated with maximum BOD removal. When the reactor retention time was decreased from 2.3 to 1.3 days the process became nonautolytic and operated at 50 to 60% BOD removal efficiency, generating biomass as a by-product. The process was operated continuously on a pilot-plant scale for more than 5 months in the autolytic mode. Operating parameters were established at three levels of nutrient chemical additions. (Witt-IPC)
W79-03398

PROCESS OF FLOTATION OF WHITE WATER -- THEORETICAL BASES AND PRACTICAL APPLICATION (PROCESSO DE FLOTACAO DE AGUAS BRANCAS -- BASES TEORICAS E APLICACAO PRATICA),
Krofta Instalacoes Industriais Ltd. (West Germany).
R. J. Helene.
O Papel, Vol. 39, p 31-38, April, 1978. 9 fig, 3 illus, 5 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, Effluents, Pulp and paper industry, Water pollution control, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Bubbles, Aeration, Water pollution treatment, White water(Paper machines), Savealls, Industrial water.

This review of flotation savealls discusses physical and chemical phenomena occurring in the flotation of paper-machine white water (flocculation of

solids and means for rendering them hydrophobic, and the fundamentals of producing disperse air bubbles in white water) and the use of flotation savealls in practice. The Supercell and Sedifloat systems are described. (Speckhard-IPC)
W79-03401

ENVIRONMENTAL PROTECTION ON CANADA'S WEST COAST,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5G.
W79-03403

REFINER PULP MILL EFFLUENT. PART I. GENERATION OF SUSPENDED AND DISSOLVED SOLIDS FRACTIONS,
New Zealand Forest Service, Rotorua.
S. R. Corson, and J. A. Lloyd.
Paperi ja Puu, Vol. 60, No. 6/7, p. 407-410, 412-413, 1978. 3 fig, 6 ref, 5 tab.

Descriptors: *Waste water treatment, *Pulp wastes, *Dissolved solids, *Suspended solids, *Groundwood mills, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Chemical oxygen demand, Water consumption(Except consumptive use), Biochemical oxygen demand, Fibers(Plant), White water(Paper machines).

An investigation of the main process streams in a large refiner mechanical pulp (chip groundwood) mill has given information on the movement of water-soluble components from the wood fiber to the white water and thence to the effluent. The COD of the mill effluent ranged from 2,000 to 3,500 mg/liter, but 100-1,500 mg/liter of this could be eliminated by removal of fiber and fines. The effluent's COD dropped from 45 to 25 kg/ton as the total mill water consumption was reduced from 30 to 15 cu m/ton. The 5-day BOD of the water flows generally followed the same pattern as the COD, except when old chips were being pulped at which time lower BOD levels were measured. (Brown-IPC)
W79-03404

CHLORINATED AND SULFONATED DEGRADATION PRODUCTS OF LIGNIN IN THE EFFLUENTS FROM THE CHLORINE BLEACHING OF SULFITE PULP (CHLORIERTE UND SULFONIERTE LIGNINABBAUPRODUKTE IN ABWAESSERN DER CHLORBLEICHE VON SULFITZELLSTOFF),
Technische Hochschule, Darmstadt (Germany, F.R.) Inst. fuer Makromolekulare Chemie.
For primary bibliographic entry see Field 5A.
W79-03405

FLOAT-WASH SYSTEM. CLOSING OF THE WATER CIRCULATION SYSTEM IN THE PULP AND PAPER INDUSTRY (FLOAT-WASH SYSTEM. SCHLIESSEN DES WASSERKREISLAUFES IN DER ZELLSTOFF- UND PAPIERINDUSTRIE),
A. Akerhagen.
Der Papiermacher, Vol. 28, No. 5, p. 74-76, May 13, 1978. 4 fig, 1 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Screens, Industrial water, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Water reuse, Recycling, Water conservation, Closed systems.

The Float-Wash system for separating fibers from a stream of water in a pulp or paper mill is based on spraying the water upward through a screen using a full-cone nozzle. The fine fraction passing through the screen forms water column above the screen while the coarse fiber fraction migrates to the periphery of the screen and falls into a container. Float-Wash units are installed in series similarly to cleaners and are mainly employed in cleaning water being recycled for use, e.g., as paper machine shower water. Installations in a tissue mill and a fiberboard mill are diagrammed. (Speckhard-IPC)
W79-03406

THE CLOSED WATER CIRCUIT OF THE ALZENAU FLUTING BOARD AND PAPER MILL (DER GESCHLOSSENE WASSERKREISLAUF DER WELLPAPPEN- UND PAPIERFABRIK ALZENAU),
For primary bibliographic entry see Field 3E.
W79-03407

WATER POLLUTION ABATEMENT IN SIBERIAN PULP AND PAPER MILLS (OCHRANA CISTOTY VOD V SIBIRSKYCH CELULOZARSKYCH KOMBINATECH),
Vyskumny Ustav Papieru a Celulozy, Prague (Czechoslovakia).
F. Nemec.
Papir a Celuloza, Vol. 33, No. 5, p. 81-82, 92, 1978. 3 ref, 3 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, *Soviet Union(USSR), Water pollution treatment, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Pulp waste, Water supply, Effluents, Biological treatment, Activated sludge, Coagulation, Chemical oxygen demand, Color, Phenols, Suspended solids, Sludge treatment, Dewatering, Treatment facilities, Flotation, Filtration, Filters, Foreign countries, Aluminum sulfate, Kraft mills, Board mills.

Water supply and effluent treatment systems used in the Baikal and Selenga pulp and paper mills (USSR) are described. The Baikal mill effluent from the production of 200,000, 10,000, and 10,000, and 10,000 tons/year of pulp, fodder yeast, and board, respectively, is treated in a biological treatment plant without a mechanical stage. The activated sludge treatment is followed by chemical-mechanical treatment using alum as a coagulant. The total effluent volume is 12,000 cu m/hr, and the treated effluent has a COD of 2-3 mg/liter (Kubel), a color of 70-80 Pt units, 600 mg/liter of mineral solids, 0.015-0.020 mg/liter of phenols, and 20-30 mg/liter of suspended solids. Excess activated sludge as well as chemical sludge has been stored in Lagoons. A dewatering system is currently under construction for biological sludge, utilizing flotation thickeners and belt filters. A combination of gravity thickeners and pressure filters is being considered for dewatering of the chemical sludge. The Selenga mill produces 240,000 tons/year of kraft pulp and board. The discharge from the mill includes 0.39, 9.8, 0.39, and 49 tons/day of 5-day BOD, COD, suspended solids, and dissolved inorganic materials, respectively. Extensive reconstruction of the mill is planned, including many in-mill changes that will further reduce the pollution load. (Trubacek-IPC)
W79-03408

BACTERIAL CHARACTERISTICS OF ACTIVATED SLUDGES TREATING CARBOHYDRATE WASTES,
Tokyo Metropolitan Univ. (Japan) Dept. of Biology.
S. Takii.
Water Research Vol. 11, No. 1, p. 85-89, 1977. 25 ref, 5 tab.

Descriptors: *Activated sludge, *Bacteria, *Carbohydrates, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp wastes, Pulp and paper industry, Effluents, Sludge, Microorganisms.

A bacteriological study was conducted on six activated sludge samples from actual plants treating carbohydrate wastes (kraft pulp mill, brewery, yeast culture, confectionery, fruit juice, and soft drink effluents), and the results are compared with the metabolic activities of the sludges and the qualities of the wastes. The sludges tested contain about 100 billion viable bacterial cells/g dry sludge. About 50 strains of bacteria isolated from each sludge sample were classified into groups according to their morphological and physiolo cal properties. Many isolates could not grow glucose as the sole carbon and energy source, ev if they were isolated from the sludges treati wastes which contained predominantly carboh drate. Most of the dominant groups of the sludg treating wastes with a low proportion of carboh drate were Gram-negative rods and were similar the genera of the sludge grown on sewage repo ed by other investigators. Their rates of oxyg consumption were higher when they were fed w casamino acids than with glucose. On the oth hand, in the sludges treating the wastes with a hi proportion of carbohydrate, Gram-positive nc spore-forming bacteria (probably belonging Corynebacterium) and lactic acid bacteria and re tively large coccus predominated. Many strains these groups had the ability to accumulate reser polysaccharide and showed a higher oxygen co sumption with glucose than with casamino acids acetate. (Witt-IPC)
W79-03415

EMISSION OF MICROBIAL AEROSO FROM POLLUTED WATERS IN DENSEL POPULATED REGIONS,
Kentucky Water Resources Research Inst., L ington.
For primary bibliographic entry see Field 5A.
W79-03438

REDUCED TOXICITY OF AN AQUEO COAL-CONVERSION EFFLUENT FOLLO ING WASTE DISPOSAL TREATMENT,
Tennessee Univ., Oak Ridge. Graduate School Biomedical Science.
For primary bibliographic entry see Field 5C.
W79-03498

5E. Ultimate Disposal Of Wastes

EVALUATION AND COMPARISON OF OVE LAND FLOW AND SLOW RATE SYSTEMS UPGRADE SECONDARY WASTEWAT LAGOON EFFLUENT,
Utah State Univ., Logan. Coll. of Engineeri
For primary bibliographic entry see Field 5
W79-03007

A STUDY OF WASTE GENERATION, TREA MENT AND DISPOSAL IN THE META MINING INDUSTRY,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5
W79-03010

A STUDY OF PESTICIDE DISPOSAL IN SEWAGE SLUDGE INCINERATOR,
Versar, Inc., Springfield, VA.
F. C. Whitmore.
Available from the National Technical Informat Service, Springfield, VA 22161 as PB-253 Price codes: A09 in paper copy, A01 in microfic Final Report No. SW-116c, 1975. 189 p, 37 tab, ref, 5 append.

Descriptors: *Waste treatment, *Ultimate dispo *Pesticides, *Incineration, DDE, DDT, Polych rinated biphenyls, Sewer sludge, Sludge treatme Incinerators, Toxins, Wastes, Pilot studies, Pro type studies, Municipal wastes, Palo Alto, Calif nia, DDD, Water pollution sources.

Pesticides, including DDT and 2,4,5-T, were lected for incineration along with sewer sludge demonstrate that a modern sewage sludge incin ator could be used in their destruction. The p gram was conducted in two phases: Phase 1 c sisted of prototype experiments performed on Envirotech Corporation six hearth furnace at B bane, California; and Phase 2 consisted of full sc experiments on the Palo Alto, California munici multiple hearth sewage sludge incinerator. Fr the six Phase 1 experiments it was concluded th destruction efficiencies for 2,4,5-T were abo 99.95% at operating conditions and above 99.9

nany cases with no tetrachlorodioxin detect-
; detectable quantities of DDD and DDE were
nd in the incineration system with no dioxin;
total DDT, DDD, and DDE in all effluent
ams did not exceed 0.04% of the feed, and
ruction of DDT was 99.96% with the after-
ner in operation; variations in feed types, pesti-
feed rate, and sludge solids content did not
ct the results. The results of full-scale experi-
nts of Phase 2 supported the results in Phase 1.
concluded that DDT and 2,4,5-T can be safely
royed by incineration with sewage sludge in a
tiple hearth furnace.
9-03013

ST OF SANITARY LANDFILL DEVELOP-
NT AND OPERATION IN ILLINOIS,
lrews (James Douglas), Springfield, IL.
primary bibliographic entry see Field 5G.
9-03014

NSERVATION OF PETROLEUM WASTES
RED RIVER ARMY DEPOT,
l River Army Depot, Texarkana TX. Dept. of
intenance Effective Engineering.
L. Yoast.
ailable from the National Technical Information
vice, Springfield, VA 22161 as AD-A015 030,
e codes: A04 in paper copy, A01 in microfiche.
al Report No. USAMC-ITC-02-08-73-023,
rch 1974. 62 p, 2 fig, 6 tab,45 ref.

scriptors: *Military reservations, *Oil wastes,
ibricants, *Ultimate disposal, Waste disposal,
Gasoline, Fuels, Solvents, Waste identifica-
, Burning, Economic efficiency, Recycling.

earch was conducted to determine: the main
rce of waste petroleum oils and lubricants
L's) at Red River Army Depot (RRAD); suit-
methods of minimizing the amount of waste
L's generated by RRAD; and the optimum
hods for disposal of the waste POL's. The
es of POL's were found to be crankcase drain-
s, diesel fuel, gasoline, transmission fluid, brake
d, hydraulic fluid, water, and solvents with the
amometer shop being a major contributor of
ste POL's. Waste POL's are collected in 55
lon drums and, in the case of the dynamometer
p, in a holding tank in the basement of the shop.
ur suggestions for reducing waste POL volume
discussed: reuse fuel from retrograde vehicles
eived RRAD for fueling depot vehicles; reuse
l from retrograde vehicles for Code F vehicles;
rease oil change interval for most depot equip-
nt; and reuse of oil used in the Depot's Dyna-
meter Engine Test Shop. Eight methods of
posal of waste POL are described and examined
the basis of economics and compliance with
my, local, State, and Federal regulations. Con-
ering these selection criteria, and quantities,
es, and collection of waste at RRAD, it is
ommended that the two types of disposal most
table are combustion for heat recovery (burn-
) and sale to an entrepreneur. (Gibson-IPA)
9-03018

ATE-OF-THE-ART SURVEY OF LAND REC-
MATION TECHNOLOGY,
tle (Arthur D.), Inc., Cambridge, MA.
B. Berkowitz, J. E. Harrison, P. A. Huska, S. L.
nnson, and P. J. O'Brien.
ailable from the National Technical Information
rvice, Springfield, VA 22161 as ADA-038 088,
ce codes: A05 in paper copy, A01 in microfiche.
port No EC-CR-76076, May 1976. 99 p, 14 fig,
tab, 37 ref. DAAA15-75-C-0188.

scriptors: *Land reclamation, *Soil contamina-
n, *Path of pollutants, *Pollution abatement,
oil treatment, Incineration, Degredation, Vege-
ion, Organic chemical wastes, Waste treatment,
cinerators, Toxicity, Chemical degradation, Soil
vestigations, Soil management, Economics, Cost
alysis, Groundwater, Surface runoff, Plant
owth, Revegetation.

ree general approaches for absolute contaminant
noval from a land area extending 1/2 square mile and 25 feet deep are considered in this state-of-the-art study. The adverse environmental effects of contaminated land areas manifest themselves in the following manner: (1) groundwater contamination due to leaching from the land; (2) contamination of surface water due to land run-off; (3) inhibited plant growth; (4) contaminant absorption by vegetation and transfer through the food chain; (5) air pollution from evaporation, sublimination, and wind erosion of contaminated soil; (6) direct contact poisoning; and (7) fire and explosition. The first method, excavation and treatment, utilizes incineration and revegetation and wet chemical processing. In situ treatment involves soil activation, vegetational uptake, innoculation, and fixation. Groundwater treatment methods include upgradient diversion and downgradient collection and treatment. These methods are compared regarding technical and economic feasibility. Schematic process flow sheets are provided for rotary kiln soil detoxification, reconstituting soil from incinerated material, chemical soil detoxification, possible sequencing of soil manipulation, and one alternative for groundwater decontamination. (Davison-IPA)
W79-03025

VOLUME REDUCTION SYSTEM FOR SOLID AND LIQUID TRU WASTE FROM THE NUCLEAR FUEL CYCLE: JANUARY - MARCH 1977,
Mound Facility, Miamisburg, OH.
D. F. Luthy, and W. H. Bond.
Available from the National Technical Information Service, Springfield, VA 22161 as MLM-2436, Price codes: A02 in paper copy, A01 in microfiche. Report No MLM-2436, July 27, 1977. 9 p, 2 fig, 4 tab, 2 ref. EY-76-C-04-0053.

Descriptors: *Radioactive waste disposal, *Incineration, *Nuclear wastes, Solid wastes, Liquid wastes, Design criteria, Laboratory tests, Waste disposal, Portland cements, Volume reduction, Elements, Metals, Trace elements, Equipment.

A survey of facilities generating radioactive waste and a fuel reprocessor was conducted to develop design criteria for a volume reduction system to treat these combustible solid and liquid wastes. Modifications of the incinerator to permit liquid waste burning are taking place. Glass and cement are being tested in continuing studies of ash immobilization; a proposed ash immobilization facility is illustrated with a flow chart. An extensive survey was conducted in order to locate the only fabricator of drum compactors for compacting empty waste containers according to specifications. (Davison-IPA)
W79-03028

MARITIME ADMINISTRATION CHEMICAL WASTE INCINERATOR SHIP PROJECT.
Maritime Administration, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 978, Price codes: A17 in paper copy, A01 in microfiche. Final Environmental Impact Statement, Report No MA-EIS-7302-76-041F, 1976. Volume 1 of 2. 369 p, 18 fig, 19 tab, 56 ref, 8 append.

Descriptors: *Waste disposal, *Chemical wastes, *Oceans, *Hazards, *Environmental effects, *Incineration, Ships, Coast Guard regulations, Spills, Continental shelf, Lagoons, Estuaries, Marine biology, Coasts, Ecosystems, Food chain, Design criteria, Intergovernmental Maritime Consultative Organization, Toxicity.

Incineration at sea has been deemed a relatively environmentally safe method for disposal of toxic chemical wastes. The impact of such a disposal method on the ocean environment is examined. The marine environment is regarded as two zones: (1) the coastal ocean which includes estuaries, adjacent wetlands, lagoons, waters over the continental shelves, and the marginal seas; and (2) the open ocean. Consideration is given to the U.S. development of an incinerator vessel; and the design, operation, and equipment of the Dutch ship, VULCANUS, designed to deal with chlorinated hydrocarbon wastes, is described. The potential hazards involved with the use of such vessels are the accidental release of harmful substances because of mishaps. It is concluded that combustion in the open ocean of toxic chemical wastes has a minimal adverse impact on the marine environment when stringent safety regulations are strictly observed. Combustion efficiencies are above 99.9% in the conversion of chlorinated hydrocarbons to water vapor, carbon dioxide, and hydrogen chloride. The principal concern of accidental spills at sea is the absorption of toxic substances by food fish. Safety control measures are detailed and alternative methods are considered. Comments on the Draft Impact Statement requested from various agencies and states are included. (Davison-IPA)
W79-03029

COMPOSTING AT JOHNSON CITY: JOINT USEPA-TVA COMPOSTING PROJECT WITH OPERATIONAL DATA, 1967-1971. VOLUMES I AND II,
Environmental Protection Agency, Washington, DC. Office of Solid Waste.
G. E. Stone, and C. C. Wiles.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 047, Price codes: A16 in paper copy, A01 in microfiche. Final Report No EPA/530/SW-31r.2, November 1975. 358 p, 80 fig, 48 tab, 21 ref, 6 append.

Descriptors: *Waste treatment, *Municipal wastes, *Waste disposal, *Composting, Animal wastes, Sewage, Decomposition, Treatment facilities, Degradation, Microbiology, Microorganisms, Equipment, Laboratory tests, Lime, Nitrogen, Phosphorus, Potassium, Organic compounds, Monitoring, Johnson City, Tennessee, Sewage sludge, Cost analysis, Public health.

A joint research and demonstration project in windrow composting of municipal solid wastes and sewer sludge is discussed. The project began in June 1967 and was terminated on June 30, 1971. A total of 33,503 tons averaging 37 tons/day of sewer sludge, cow manure, paunch manure, poultry manure, animal blood, pepper canning wastes, and municipal waste were composted in windrows. Windrow temperatures were maintained at 122F to 130F for seven days to destroy the pathogens contained in the refuse. Windrow temperatures at the 1 1/2 ft. level averaged above 140F for two or three weeks, and it was determined that the compost was safe with regard to potential health problems. The technical feasibility of windrow composting of municipal wastes and sewer sludge was established; the quality of the compost was continually upgraded during the project. Plant construction costs totaled $960,452; mobile equipment used in plant operations cost $61,280. Operating costs for 1968 were $18.45/ton of refuse processed; 1971 operating costs were $19.70 tons. Cost estimates for various sized plants, based on the study data, are presented. The composts obtained from this plant were lower in phosphorus nitrogen and potassium than commercial inorganic fertilizers but did contain micronutrients required for good plant growth. Favorable responses to compost under field demonstration conditions were from high cash value crop producers and home and garden users. During the project, medical surveillance of the composting plant employees was maintained, and it was determined that no significant abnormalities were found among them. (Davison-IPA)
W79-03032

A RECYCLED-WATER SANITARY WASTE DISPOSAL SYSTEM,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5D.
W79-03034

KINETICS OF WET OXIDATION OF NYLON 66,
Connecticut Univ., Storrs. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-03125

NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,
Nova Scotia Technical Coll., Halifax. Dept. of Bio-Resources Engineering.
For primary bibliographic entry see Field 5D.
W79-03178

A COMPREHENSIVE STUDY OF SUCCESSIONAL PATTERNS OF PLANTS AND ANIMALS AT UPLAND DISPOSAL AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
Final Report, Contract D-77-2, March 1979. 515 p, 45 fig, 101 tab, 163 ref, 5 append. DACW39-74-C-0092.

Descriptors: *Waste disposal, *Dredging, *Biological communities, *Biota, *Habitats, Vegetation, Ecology, Sites, Terrestrial habitats, Biological properties, Ecology, Succession, Vegetation, Biorhythms, Vegetation regrowth, Wildlife.

Five sites were selected for active research to collect biophysical data concerning the ecological succession on upland dredged material substrates. The study was based on one sampling area for each of the following: (1) Mott Island, Connecticut, in the Connecticut River; (2) six disposal islands in Hillsborough Bay, Tampa, Florida; (3) a disposal area associated with Whiskey Bay Pilot Channel in the Atchafalaya River Basin, Louisiana; (4) a disposal area associated with the Gulf Intercoastal Waterway between Port Arthur and Galveston, Texas; and (5) Mott Island in the Columbia River near Astoria, Oregon. On-site analysis of the biota combined with ingterpretation of available historical photography, disposal history data, and summary knowledge of regional biophysical characteristics were used to hypothesize past, present and future successional changes. All of the areas studied exhibited characteristics of insular habitats, whether or not they were constructed as true islands, or were land disposal sites due to the similar factors affecting the ecological succession. It is concluded that careful design of disposal sites, through active stocking, could enhance habitat and biotic diversity, or hasten the succession and self-perpetuation of biotic communities. The potential for habitat management on upland dredged material disposal areas is dependent on recognizing the productive seral stages supported by such factors as soil conditions, climate, flooding, fire, and intermit-disposal area, for example: islands are good bird breeding habitats, but unsuitable for timber. (Davison-IPA)
W79-03257

SURVEY OF METHODS USED TO CONTROL WASTES CONTAINING HEXACHLOROBENZENE,
TRW Systems, Inc., Redondo Beach, CA.
S. Quinlivan, M. Ghassemi, and M. Santy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 051, Price codes: A05 in paper copy, A01 in microfiche. Final Report No. EPA/530/SW-120c, November 1976. 95 p, 2 fig, 30 tab, 39 ref, 1 append. 68-01-2956.

Descriptors: *Waste disposal, *Ultimate disposal, *Hexachlorobenzene, *Industrial wastes, *Water pollution sources, Waste treatment, Data collections, Surveys, Solvents, Pesticide residues, Landfills, Deep-well pumping, Ponds, Incineration, Burning, Hazards, Environmental control.

Results of a survey to identify the sources and characteristics of manufacturing wastes containing hexachlorobenzene (HCB), to review and document methods used for treatment and disposal of HCB wastes, and to evaluate the environmental adequacy of the treatment and disposal methods are presented. Based on a literature search and some contact with industry, 14 industries/operations were identified as possible sources of HCB wastes. Of these, chlorinated solvents production and pesticide manufacturing were found to be the two major sources. Methods currently used for the ultimate disposal of HCB include land disposal (sanitary landfill, industrial landfill, deep well injection and drying ponds), incineration (with or without byproduct recovery), open pit burning, resource recovery, discharge to municipal sewage treatment plants, and emmission to the atmosphere, with land disposal being the most prevalent method. Results of an evaluation of the methods indicate that incineration with emission control and byproduct recovery is the most desirable and environmentally acceptable technology for the destruction of HCB wastes. (Gibson-IPA)
W79-03266

JPL ACTIVATED CARBON TREATMENT SYSTEM (ACTS) FOR SEWAGE,
Jet Propulsion Lab., Pasadena, CA.
For primary bibliographic entry see Field 5D.
W79-03268

DESTRUCTION OF POLYCHLORINATED BIPHENYLS IN SEWAGE SLUDGE DURING INCINERATION,
Versar, Inc., Springfield, VA.
F. C. Whitmore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 162, Price Codes: A05 in paper copy, A01 in microfiche. Final Report, 1976. 73 p, 22 fig, 16 tab, 11 ref, 1 append. 68-01-1587.

Descriptors: *Incineration, *Sludge disposal, *Polychlorinated biphenyls, *Sewage sludge, Air pollution, Solid wastes, Waste disposal, Aromatic compounds, Chlorine, Gases, Testing, Effluents.

To determine the efficiency with which polychlorinated biphenyls (PCB's) are destroyed in a municipal sewage sludge incinerator, an experiment was conducted in which the sludge input to an incinerator was deliberately doped with a suitable PCB preparation (Aroclor 1254) at a level of 50 ppm (dry weight). Samples were taken of the afterburned gases, the stackgases, scrubber water output and ash (from the bottom hearth) after allowing the furnace to come to equilibrium. Results showed: no PCB in either scrubber water effluent or in the ash; combustion proceeded with great rapidity in the high temperature, water saturated gas stream prior to quenching; less than 6% of the injected PCB's escaped destruction; and very little PCB on the particulate matte either the afterburner breach or in the stack exhaust. (Gibson-IPA).
W79-03269

CONTINUOUS SEWAGE SLUDGE HEAT TREATMENT APPARATUS,
For primary bibliographic entry see Field 5D.
W79-03310

INFLATABLE STRADDLE PACKERS AND ASSOCIATED EQUIPMENT FOR HYDRAULIC FRACTURING AND HYDROLOGIC TESTING,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7B.
W79-03342

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 5B.
W79-03382

PROCESS FOR TREATING MATERIALS SUCH AS COMBUSTIBLE SLUDGES IN A FLUIDIZED-BED REACTOR (PROCEDE DE TRAITEMENT DE MATIERES, TELLES QUE NOTAMMENT DES BOUES COMBUSTIBLES, DANS UN REACTEUR A LIT FLUIDISE).
Ahlstrom (A.) Osakeyhtio, Helsinki (Finland).
French Patent No. 2,365,754. April 21, 1978. 27 p, 6 fig, 1 tab, 16 claims.

Descriptors: *Pulp wastes, *Sludge treatment, *Burning, *Patents, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Sludge, Solid wastes, Waste disposal, Water pollution control

A process for combustion of sludges (particularly mechanically dewatered pulp-mill and paper-mill sludges) in a fluidized bed is characterized by the removal of hot particles from the reactor flue gases and use of at least part of these particles in preheating and partially drying the sludge prior to introduction into the reactor. (Speckhard-IPC)
W79-03395

USE OF 'BIOPOND SLUDGE' AS A FEED INGREDIENT FOR PEN-REARED COHO SALMON,
Weyerhauser Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03474

5F. Water Treatment and Quality Alteration

MIUS TECHNOLOGY EVALUATION - WATER SUPPLY AND TREATMENT,
Oak Ridge National Lab., TN.
A. L. Compere, W. L. Griffith, W. J. Boegly, Jr., I. Spiewak, and D. G. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-HUD-MIUS-21, Price codes: A07 in paper copy, A01 in microfiche. Report No. ORNL/HUD/MIUS-21, April 1976. 144 p, 29 fig, 36 tab, 118 ref, 1 append. W-7405-eng-26.

Descriptors: *Modular Integrated Utility System Program, *Water supply development, Water treatment, *Technology, Utilities, Water works, Water quality, Potable water, Water quality, Groundwater, Surface water, Coagulation, Desalination, Disinfection, Filtration, Flocculation, Costs, Separation techniques.

Methods and processes which could be used in the Modular Integrated Utility System (MIUS) Program for the treatment of potable water are evaluated. Treatment required to provide potable water varies with the quality of the water supply. Water quality and treatment processes appropriate for ground and surface waters are examined. Ground waters usually require less treatment, and many supplies may need only disinfection and/or softening; costs of providing potable water from ground supplies are considerably lower than those of providing water from other sources. The technology discussed is largely appropriate to the treatment of surface water supplies. Many surface water supplies can be suitably treated through the use of small, commercially available pre-engineered water treatment plants, but a separate evaluation of the treatment appropriate for each MIUS site is recommended. Costs for these plants are similar to extrapolated capital costs of conventional treatment plants; it is indicated that cost/unit size increases as plant capacity decreases. A treatment system for MIUS potable water may include disinfection, coagulation and flocculation, solids separation, and filtration. The provision of additional labor may be necessary for compliance with regulatory agency standards; automation will reduce onsite labor. Technology, available for the treatment of brackish water supplies, provides high quality potable water. Provision of fire protection water should be considered in an economic evaluation, because it represents a large portion of the water treatment plant and carriage costs for MIUS. (Davison-IPA)
W79-03016

ENERGY REQUIREMENTS FOR WATER TREATMENT SYSTEMS.
Ontario Ministry of the Environment, Toronto. Applied Sciences Section; and Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
G. D. Zarnett.
Research Paper No. S2043, November 1976. 15 p, 1 fig, 1 tab, 8 ref.

scriptors: *Energy equation, *Water treatment, ystems, Water pumping, Velocity, Flow friction, ration, Coagulation, Flocculation, Sedimenta- n, Filters, Head loss, Mass transfer, Chemical dation, Disinfection, Energy.

ta compiled from literature concerning the ergy requirements of water treatment equipment tabulated according to operation and process. ese operations include: aeration, coagulation d flocculation, mixing and sedimentation, thick- ers and clarifiers, filters, mass transfer oper- ons, chemical oxidation and disinfection, other emicals-energy required for production, and hts and miscellaneous power. It is suggested that s data be used comparatively, and in conjunc- n with the mechanical energy equation. (Davi- n-IPA)
79-03021

ZONIZATION OF WATER CONTAINING UMIC COMPOUNDS, PHENOLS, AND PES- CIDES (OZONIROVANIYE VODY, SODERZ- ASHCHEY GUMINOVYE SOYEDINENIYA, NOLY I PESTITSIDY),
r primary bibliographic entry see Field 5D.
79-03027

DERAL GUIDELINES: PRETREATMENT F POLLUTANTS INTRODUCED INTO PUB- CLY OWNED TREATMENT WORKS,
vironmental Protection Agency, Washington, C. Office of Water Program Operations.
r primary bibliographic entry see Field 5D.
79-03250

HOOL WATER SUPPLY FLUORIDATION,
vironmental Protection Agency, Washington, C. Office of Water Supply.
Bellack.
ailable from the National Technical Information rvice, Springfield, VA 22161 as PB-257 962, ce Codes: A02 in paper copy, A01 in micro- he. 1972. 21 p, 5 fig, 22 ref.

scriptors: *Water treatment, *Fluoridation, chool(Education), Engineering, Equipment, blic health, Flow control, Water control, Flow ters, Water measurement, Pipelines, Installation, intenance.

simplified procedure for fluoridating a school ter supply is presented. School and community ter fluoridation systems have basically similar gineering aspects, except that fluoridation is intained at a higher level for a school system. e equipment, which varies depending on the size the water system and its complexities, consists of olution container, a solution feeder and a water ter. Procedures for selecting the school site tallation are set forth; surveillance, maintenance d trouble-shooting are discussed. It is concluded t the varying conditions at individual sites may uire further engineering consultation. (Davison- A).
79-03260

RELIMINARY LISTING OF MUNICIPAL ATER SUPPLY CAPACITIES,
lahoma Foundation for Research and Develop- nt Utilization, Inc., Edmond.
r primary bibliographic entry see Field 3D.
79-03261

EEZE DESALINATION AND CONCENTRA- ON APPARATUS,
r primary bibliographic entry see Field 3A.
79-03312

OZZLE FOR ROTARY FILTER PIPE,
E. Stuart, Sr.
S. Patent No. 4,113,183, 4 p, 5 fig, 8 ref; Official zette of the United States Patent Office, Vol 4, no 2, p 793-794, September 12, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Filtration, Filters, Equipment, Nozzles, Turbulent flow, Backwashing, Sand filters.

In sand type filters, a pipe is placed beneath the surface of the sand bed and is rotatable on a vertical axis, located in the middle of the length of the pipe. It has nozzles extending along the trailing side of the pipe on each side of the axis of rotation. When these nozzles are supplied with fluid under pressure they cause the pipe to rotate and the water from the nozzles will agitate the filter and wash it. A nozzle for this purpose is illustrated in U.S. Pat. No. 3,351,292 and the present invention represents an improvement by providing additional passages for fluid from the nozzle which not only assist in impelling the pipe in its rotary action but also provide for increased agitation of the filter bed. (Sinha - OEIS)
W79-03315

METHOD OF IMPROVING THE BACKWASHING OF FIXED BEDS FORMED OF GRANULAR MATERIALS,
Sulzer Bros. Ltd., Winterthur (Switzerland). (Assignee).
For primary bibliographic entry see Field 5D.
W79-03316

PROCESS FOR TREATING DRINKING WATER AND SEWAGE,
H. Corte, H. Heller, M. Lange, and O. Netz.
U.S. Patent No. 4,115,261, 4 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1486, September 19, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Waste water treatment, Water pollution treatment, Organoleptic properties, *Odor, *Taste, Adsorption, *Resins, *Polymers, Organoleptic properties.

A process removes oleophilic odor- and tasteproducing substances from water by treating the water with an insoluble, macroporous adsorber resin comprising a matrix based on a cross linked organic polymer containing aromatic nuclei. The polymer contains chloromethyl groups as substituents and some of the chlorine atoms in the chlormethyl groups can be reacted with ammonia or amines. Furthermore the invention relates to the adsorber resins to be used in the claimed process. (Sinha - OEIS)
W79-03323

WATER PURIFICATION METHODS,
International Telephone and Telegraphy Corp., Nutley, NJ. (Assignee).
E. W. Sawyer, Jr.
U.S. Patent No. 4,116,826, 9 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 4, p 2028, September 26, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Adsorption, *Clays, Toxins, Heavy metals, Pesticides, Viruses, Hormones, Attapugite clay, Regeneration.

Various grades of attapulgite clay and sepiolite are used to treat water using contacting or percolation techniques to remove substances not removable by standard water purification methods under many conditions. Substances such as pesticides, toxins, hormones, heavy metal cations and viruses are removed from water by adsorption upon the clay surface. When contacting is employed, the clay containing the adsorbed substances is subsequently removed by sedimentation or filtration. The clays can be regenerated by appropriate chemical or thermal techniques. (Sinha - OEIS)
W79-03331

STUDIES ON THE USE OF COAGULATION AIDS FOR TREATMENT OF BOILER FEEDWATER (CERCETARI PRIVIND UTILIZAREA ACCELERATORILOR DE COAGULARELA TRATAREA APELOR DE ALIMENTARE A CAZANELOR),
For primary bibliographic entry see Field 3F.
W79-03393

5G. Water Quality Control

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 5C.
W79-03005

SIGNIFICANCE OF TURBIDITY FOR QUALITY ASSESSMENT OF AGRICULTURAL RUNOFF AND IRRIGATION RETURN FLOW,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W79-03006

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM, AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5D.
W79-03011

COST OF SANITARY LANDFILL DEVELOPMENT AND OPERATION IN ILLINOIS,
Andrews (James Douglas), Springfield, IL.
J. D. Andrews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 546, Price codes: A06 in paper copy, A01 in microfiche. Final Report No. IIEQ 76-15, July 1976. 116 p, 10 fig, 13 tab, 42 ref. 40.024.

Descriptors: *Landfills, *Costs, *Cost analysis, Operating costs, Maintenance costs, Waste treatment, Solid wastes, Surveys, Sites, Project planning, Equipment, Illinois, Cost comparisons, Waste disposal.

A study of private and public owned sanitary landfills accepting residential refuse and serving communities in Illinois is reported. Forty-five sites were selected for interviews on the size of operation, type of ownership and operation, and location within the state. Surveys were conducted at 23 sites representing about 10% of the total number of residential refuse sanitary landfills in Illinois. A literature review of sanitary landfill practices and costs, conducted for the period 1970 to 1975, provided a basis for comparison with current developmental, operational and closing costs. Landfill development is presented, and includes: planning an engineering, site development, site operation, and site closing and maintenance. Sanitary landfill sites were classed into five categories according to their size and the amount of refuse processed per week. Summaries of cost data are presented according to these categories. (Davison-IPA)
W79-03014

MIUS TECHNOLOGY EVALUATION -- WATER SUPPLY AND TREATMENT,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5F.
W79-03016

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES; GASIFICATION: SECTION 5. BI-GAS PROCESSES,
Exxon Research and Engineering Co., Linden, NJ.
C. E. Jahnig.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 694, Price codes: A04 in paper copy, A01 in microfiche.

Final Report No. EPA-650/2-74-009-g, May 1975. 73 p, 3 fig, 16 tab, 38 ref. 68-02-0629.

Descriptors: *Coals, *Air pollution, *Coal gasification, *Environmental effects, Water pollution, Air pollution control, Wastes, Pollution abatement, Trace elements, Effluents, Liquid wastes, Solid wastes, Sulfur, Fossil fuels, Gases.

Results of a study to evaluate environmental aspects of the BI-GAS coal gasification process are presented. Modifications were made to the commercial plant projections developed by Air Products and Chemicals, Inc., which was used as the basis for the study. The plant design includes shift conversion and methanation to produce a gas with a heating value of 943 Btu/cu ft., available at 1,075 psia. The plant, sized to make 250 million SCFD of pipeline gas, uses Western Kentucky coal. The coal is cleaned and washed, and 14,535 tons/day provide all the fuel for drying and utilities production and the gasification requirements. Effluents to the air and liquid and solid effluents generated by the process are examined. Preparation of the raw gas so that it can be methanated to higher Btu pipeline gas is described. Although the trace elements contained in coal are less than 1% concentration, their potential environmental impact is considered. Alternatives to improve the thermal efficiency of the process include: the addition of facilities to control sulfur emission on furnaces firing high sulfur coal; flue gas clean-up; dust recovery; and general efficiency items to conserve fuel. Areas requiring further study are discussed. (Davison-IPA)
W79-03019

GUIDE TO CRITERIA FOR LABORATORY EVALUATION OF BACKFLOW PREVENTION DEVICES FOR PROTECTION OF POTABLE WATER SUPPLIES,
National Engineering Lab. (NBS), Washington, DC. Center for Building Technology.
G. C. Sherlin, R. W. Beausoliel, and L. S. Galowin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 303, Price codes: A07 in paper copy, A01 in microfiche. Final Report No NBSIR 76-1020, March 1976. 44 p, 2 fig, 4 tab, 14 ref, 1 append. 462,4190. EPA-IAG-0170(D)A.

Descriptors: *Materials testing, *Water quality control, *Potable water, Fluid mechanics, Laboratory tests, Field tests, Valves, High pressure valves, Design criteria, Performance, Specifications, Reliability, Equipment, Plumbing, Water supply.

Detailed requirements, criteria and test procedures for rating reduced pressure principle back pressure backflow preventors are outlined. This type of device consists of two independently acting check valves, internally force loaded to a normally closed position, and separated by a chamber with an automatic relief for venting to the atmosphere, which is internally force loaded to a normally open position. They operate under continuous pressure. Details are given on criteria for: size, working pressure, flow capacity, structural strength, mechanical function, misassembling, evidence of failure at barriers, location of test cocks, debris collection at relief valve opening, leakage, repairability, release of trapped air, corrosion resistance, and durability. Laboratory testing includes hydrostatic tests of the complete housing and the outlet. Field tests include operation of differential relief valve, testing check valves No. 1 and No. 2. Instructions for marking and installation are given and terms are defined. A leakage test developed at Oak Ridge National Laboratory is discussed. (Davison-IPA)
W79-03022

EFFECTS OF MOSQUITO CONTROL DITCHING ON JUNCUS MARSHES AND UTILIZATION OF MOSQUITO CONTROL DITCHES BY ESTUARINE FISHES AND INVERTEBRATES,
North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.
H. L. Marshall.
PhD Dissertation, 1976. 197 p.

Descriptors: *Salt marshes, *Ditches, *Marsh plants, Wetlands, Marshes, Tidal marshes, Aquatic animals, Aquatic habitat, Fish, Aquatic invertebrates, Spoil banks, Vegetation establishment, *North Carolina.

Large areas of irregularly flooded North Carolina salt marsh dominated by Juncus roemerianus have been ditched in an attempt to control mosquito breeding. Ditching increased the area of available aquatic habitat in the marshes by a factor of about five, but spoil piles now occupy 10-13% of the ditched marsh. The ditches were inhabited by numbers of juvenile fishes, crabs, and shrimps, especially during late winter, spring, and early summer. The ditches increase the amount of nursery area available for fishes and invertebrates including some of commercial and sports interest. Except for the direct effects of the spoil which was piled on top of the marsh during ditching, no large changes were evident in the density and growth of adjacent Juncus. Bushy vegetation, especially Buccharis and Iva, had invaded many of the spoil piles and in some cases had grown up along the ditches. Many spoil piles were not covered significantly by vegetation even after eight years. Erosion of spoil piles continues to form water-retaining levees along ditches. (Steiner-Mass)
W79-03023

FACTORS UTILIZED IN THERMAL POWER PLANT SITING: A REVIEW THROUGH THE MID-19702,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
B. C. Dysart, III, and A. Kellizy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 700, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute. Clemson University, Report No 72, April 1978. 31 p, 10 tab, 49 ref. OWRT B-049-SC(2).

Descriptors: *Thermal powerplants, *Site selection, *Thermal pollution, Environmental effects, *Sites, Reviews, Costs, Available water.

Described is the evolution of siting factors and criteria for locating thermal electric power generating stations. Until the early 1960s, such factors were generally limited to land costs, site preparation costs, delivered fuel costs, transmission costs to the load center, and availability of the cooling water needed. The advent of nuclear power plants led to other important considerations in screening and finally selecting a thermal power plant site. Included were geological analysis for fault-free foundations, hydrologic analysis to reveal the consequences of accidental radiological emissions to surrounding waters, and meteorological analysis to discover the possible fate of emissions to the air. With the 1970s, the siting process became increasingly involved with a variety of environmental, political, institutional, and social factors in addition to added technical and economic factors. The anticipated trend for the future, as of 1973, was determined based on interviews with utility, industry trade association, consulting firm, and regulatory agency personnel.
W79-03035

EVALUATION OF ALTERNATIVE STORMWATER MANAGEMENT POLICIES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W79-03039

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
R. W. Fuessle, R. M. Lyon, E. D. Brill, Jr., G. E. Stout, and K. E. Wojnarowski.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol 104, No WR1, Proceedings Pap 14183, p 193-209, November 1978. 3 fig, 8 tab, ref. EPA R-804821.

Descriptors: *Ohio River, *Cooling towe *Thermal powerplants, *Water loss, *Low flo Irrigation, Municipal water, Industrial water, Pl ning, Environmental effects, Water quality, Wa supply, Energy, Coal-gasification plant.

Widespread adoption of evaporative cool towers will significantly increase water consun tion by power plants over the coming decad The analysis presented includes consideration allocation issues associated with growing comp tive uses: (1) municipal; (2) industrial; (3) irrigati and (4) in stream uses. Given hypothetical pl siting strategies suggested by the initial work of Ohio River Basin Energy Study, consumption represent high percentages of flows in the tributa basins of the lower Ohio River Basin, especia during 7-day, 10-yr low-flow conditions. C sumption levels were shown for tributary ri basins in Illinois, Indiana, Kentucky, and Oh Alternatives to high levels of consumption w suggested. In addition to presenting an analysis water allocation in the Ohio Basin, a useful fra work for analyzing water allocation in other gions was suggested. (Singh-ISWS)
W79-03057

SOIL EROSION CONTROL ON CONSTRU TION SITES WITH PORTLAND CEMENT,
Science and Education Administration, Oxfo MS. Sedimentation Lab.
For primary bibliographic entry see Field
W79-03058

ECONOMIC DEMAND FOR WATER A ECONOMIC COSTS OF POLLUTION C TROL,
Houston Univ., TX.
R. G. Thompson.
In: Proceedings of a Workshop on Modelling Water Demands, 17-21 January 1977, Laxenbu Austria. J. Kindler, Ed., International Institute Applied Systems Analysis, CP-78-6, Laxenbu Austria, June 1978, p 19-36. 12 fig, 1 tab, 3

Descriptors: *Water demand, *Water pollu control, *Water policy, *Evaluation, *Econom Energy, Fuels, Prices, Withdrawal, Agricult Industrial model, Incremental costs, Systems a ysis.

Increasing scarcity of water resources requir reassessment of past trends in water use and evaluation of water use. Evaluating the econo resource, and technology consequences of diffe water policies requires a synthesis of relevant te nical information into a comprehensive econo framework. This framework is needed to eval how the economic demands for water and economic costs of pollution control will be aff ed by different water conservation and envi mental enhancement policies. Also, this framew is needed to evaluate the interactive effects wide range of policies on the economic dem for water, the economic costs of pollution con the economic demands for energy, and the nomic demands for resource recovery. (Bell-C nell)
W79-03085

PLANNING IN SMALL- AND MEDIUM-S ILLINOIS MUNICIPAL WATER SYSTEMS,
Illinois Univ. at Urbana-Champaign
For primary bibliographic entry see Field
W79-03097

A COMMUNITY SURVEYS ITS SANITAT PROBLEMS,
Bowling Green State Univ., OH. Dept. of Soci gy.
J. E. Kivlin, F. C. Fliegel, and N. Sharma.
Small Town, Vol. 6, No. 12 p. 7-10, June 197 tab, 17 ref.

scriptors: Economics, *Surveys, Public health, linois, *Sanitation, *Water pollution control, Af- native action.

sed on self-administered questionnaires given to voting age adults in a town of about 2700 idents, this paper concludes that information npaigns which attempt to move people into rmative action on water pollution control issues uld be successful in small communities. The a revealed that favorable pollution control atti- les in small communities correlated positively h information gained through oral and written nmunications. The data also indicated a relative ence of demographic relationships in responses. us, concern for pollution control appears to be dely distributed; blue-collar workers' relatively v educational and occupational prestige levels not likely to represent major obstacles to the cess of small community pollution control cam- gns. Overcoming perceived self-interest, ac- ding to questionnaire analysis, should perhaps the main concern of pollution control cam- gns. Contradictory positions by surveyed indi- uals on a local pollution problem and what to about it could often be attributed to 'subjective s'; opinions and behavior oriented towards en- ncement of self. Campaigns which plan against bias in their strategies, suggests the study uld prove successful.
9-03098

LINOIS NATURAL HISTORY SURVEY RE- RTS OF CLAMS AND DUCKS,
nois Natural History Survey, Urbana.
primary bibliographic entry see Field 7C.
9-03100

CTERIAL ECOLOGY OF STRIP MINE EAS AND ITS RELATIONSHIP TO THE ODUCTION OF ACIDIC MINE DRAINAGE,
io State Univ., Columbus. Dept. of Microbiolo-

R. Dugan.
e Ohio Journal of Science, Vol. 75, No. 6, p. -279, November 1975. 12 fig, 1 tab, 50 ref. VRT A-001-OHIO(2).

scriptors: *Acid mine water, *Acid bacteria, rip mines, Sulfuric acid, Pyrite, *Sulfate reduc- bacteria, *Mine drainage, *Bacteria, Water pol- on, *Acidophilic bacteria, Coal mine refuse.

e activity of acidophilic bacteria as agents in- ved in the production of sulfuric acid from iron ite (FeS2) found in association with coal mine se or spoils was reveiwed. Data were present- which demonstrated the inhibitory effect of nic detergents and certain organic acids on the wth and metabolism of the acidophilic thioba- . The influence of acidic mine drainage on the roflora of non-acid polluted streams was con- ered. Also discussed were the heterotrophic mi- bes which are indigenous to acid (pH 3.0) ams and acid coal refuse, with a section devot- to the potential for sulfate reducting bacteria as nts for removal of sulfuric acid from the ams. (Chao-Ohio).
9-03104

TIMAL PLANNING FOR URBAN STORM AINAGE SYSTEMS,
due Univ., Lafayette, IN. School of Civil Engi- ring.
primary bibliographic entry see Field 6A.
9-03107

ANNING STORM-DRAINAGE SYSTEMS R URBAN GROWTH,
due Univ., Lafayette, IN. School of Civil Engi- ring.
primary bibliographic entry see Field 6A.
9-03108

ATE LAWS AND INSTREAM FLOWS,
stern Natural Resources Foundation, Salt Lake y, UT.

For primary bibliographic entry see Field 6E.
W79-03120

DEVELOPING A STATEWIDE WATER INFOR- MATION SYSTEM FOR MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D.
W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESO- TA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D.
W79-03122

THE IMPACT OF ENVIRONMENTAL LEGIS- LATION ON ECONOMIC DEVELOPMENT IN APPALACHIAN NEW YORK.
New York State Dept. of Environmental Conservation, Albany. Office of Program Development and Planning.
For primary bibliographic entry see Field 6G.
W79-03145

RESIDUALS MANAGEMENT PRIORITIES FOR THE MONONGAHELA RIVER BASIN.
Resource Planning Associates, Inc., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 900, Price codes: A09 in paper copy, A01 in microfiche. Prepared for Appalachian Regional Commission, Washington, D.C., Final Report, July 1976. 27 tab, 18 append. 76-28 CO-4410-75I-302-0624.

Descriptors: *Water quality, *Air pollution, *Water pollution, *Air quality, *Model studies, *Appalachia, *Monongahela River Basin, *Environmental quality, *Residuals management, *Resources management, *Residuals Management Priority Model, Natural resources, Public investments, Cost-benefit analysis, Population, Environmental effects, River basins, Land subsidence, Solid wastes, Public health, Strip mining, Data inventory.

The purpose of this report is to adapt the Residuals Management Priority Model (RMPM) to the needs of the Appalachian Regional Commission and to the specific characteristics of the Monongahela River Basin. The model identifies pollutants or residuals associated with processes/sources; and receptors or elements that are affected by the pollutants. Then, to calculate damages in a given geographical area, the level of pollution in the area and levels of the presence or density of the receptors in the area are measured. These damages are ranked according to the following value systems: impact on long-term quality of natural resources; impact on health hazards caused by population; impact on economic costs of pollution in the basin from the view point of the nation and of the region; and impact on damages from the viewpoint of the individual. Damages associated with 20 pollutants in the Basin were evaluated for these value systems. The pollutants that cause the greatest damage in all value systems are strip mining, acidity/alkalinity, solid waste, coliform, sulfur oxides, and pH. The least damage is caused by subsidence, hydrocarbons, dissolved oxygen, and thermal pollution. Details of the methodology, findings and recmmendations are listed in the report. The information is supplemented by appendices that document the data base used, that list major data entries and references, and that present a glossary of key technical terms employed in the study. This report is intended as a summary of results from Phase I of the study. Phase II of the model will consist of a cost/benefit analysis of alternative pollution abatement strategies. (Coan-NC)
W79-03146

WATER AND SEWER FUNDING PROGRAMS AT FMHA, EDA, AND HUD: A SURVEY OF ENVIRONMENTAL IMPLICATIONS,
National Wildlife Federation, Washington, DC. Resources Defense Div.
P. Slesinger.
Prepared for Council on Environmental Quality, Washington, D.C., March 1, 1977. 53 p.

Descriptors: *Water quality, *Water supply, *Interceptor sewers, *Government finance, *Farmer's Home Administration, *Economic Development Administration, *U.S. Dept. of Housing and Urban Development, *Funding programs, Water supply development, Public utilities, Water distribution, Community development, Water management(Administrative) Planning, Federal government, Government supports, Environmental effects, Public works, Environmental impact statements, Growth.

This report determines whether the public works programs of certain federal agencies induce sprawl and adverse environmental changes. The programs of the Farmer's Home Administration (FmHA), the Dept. of Housing and Urban Development (HUD), and the Economic Development Administration (EDA) are examined in relation to the construction and expansion of water supply and sanitary sewer systems, particularly interceptor sewers and water transmission lines. The various programs of each agency are briefly summarized, described in terms of awards and loan obligations, assessed terms of funding patterns, and analyzed as to the adequacy of each agency's NEPA regulations with respect to the CEQ guidelines and other non-NEPA environmental regulations. To the extent possible, the report assesses the quality of environmental review by the agencies and the impact of their projects on the environment. Data were collected from each agency's annual fiscal report, agency regulations, agency field instructions and environmental impact statements, and interviews. Conclusions and recommendations for each agency are provided. Indications are that of the three agencies, EDA is doing the best job. Both FmHA and HUD programs are creating adverse environmental impacts. The main conclusion is that the sewer and water programs of EDA, FmHA and HUD should be administered by one agency. (Coan-NC)
W79-03147

SPILL RISK ANALYSIS PROGRAM: METH- ODOLOGY DEVELOPMENT AND DEMON- STRATION. FINAL REPORT,
ORI, INc., Silver Spring, MD.
L. A. Stoehr, C. H. Morgan, F. J. Reiffler, and P. M. Tullier.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 954, Price codes: A13 in paper copy, A01 in microfiche. Sponsored by Department of Transportation, U.S. Coast Guard Headquarters, Office of Research and Development, Report No. CG-D-21-77, April 1977, 299 p, 45 fig, 20 tab, Vol I of II. DOT-CG-31571-A.

Descriptors: *Accidents, *Simulation, *Spills, *Model studies, Pollution, Safety, Decision making, Planning, Dynamic programming, Regulation, *Casualty analysis, *Spill-risk analysis, *Marine safety, *Collision avoidance, Casualty reduction.

This report presents research and results in the development and demonstration of scientific methods for measuring the effectiveness of merchant marine safety programs. It provides methods of quantitatively measuring change in marine accident probability associated with specific rules and regulations. Two methods for evaluating these safety programs were employed: (1) the Quasi-Experimental Method for analysis of casualty records to assess the potential effectiveness of safety measures and to clarify the sources of collision causes; and (2) the Scenario Model for exploring ship collision risk and avoidance capabilities. When formulating the QEM, there were several underlying assumptions: both vessels are operated in a safe and prudent manner; both vessels on a potential

collision course detecr each other ahead of coming close in proximity; a passing strategy is assumed; and both make necessary maneuvers to achieve a safe passing. Based on these assumptions, collision-event sequence diagrams and safety analysis logic trees (SALT) were produced. The programs analyzed using the QEM were: bridge-to-bridge radiotelephone effectiveness; collision-avoidance radar system effectiveness; and collision causes. Human factors were cited as the most important area when reducing collision risks. The scenario model is a dynamic computer simulation of the two-ship collision situation. It expresses a mathematical relationship among diverse factors that permits some measurement of alternatives. The major conclusion was that if the speed of the erring vessel is decreased by half, 80% of the collisions in the meeting scenario could be avoided and all collisions in the overtaking scenario could be avoided. (Coan-NC)
W79-03148

ACCOMPLISHMENT PLAN, REGION VIII, UTAH LAKE-JORDAN RIVER BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 281, Price codes: A05 in paper copy, A01 in microfiche. December 1972. 97 p.

Descriptors: *Water quality, *Water resources development, *Water pollution, *Waste water treatment, *Utah Lake(UT), *Jordan River Basin(UT), Sewage treatment, Sludge, Industrial wastes, Residential wastes, Biochemical oxygen demand, Coliform, Dissolved oxygen, Total suspended solids, Utah, Regional planning.

The Utah Lake-Jordan River Basin encompasses the headwaters to the Great Salt Lake including all of Salt Lake and Utah Counties. The accomplishment plan covers 940 stream miles and 150 square miles of surface water. Pollution problems arise from recreational/second home developments and from major industrial dischargers like U.S. Steel. Present waste water treatment efficiency does not meet state effluent standards and generally violates instream standards. The report discusses pollutant loadings, water quality standards, and tactical solutions to pollutant problems so that water quality of the Utah Lake-Jordan River Basin can meet instream 'C' standards by June 30, 1976. Tables of basin load summaries are presented showing fifth day BOD and coliform levels, proposed decreases of these levels over fiscal years '73-'76, water quality objectives, and the year in which the minimum acceptable water quality levels are to be achieved. A chronological ordering of planned accomplishments is shown outlining specific steps EPA officials should take to insure adequate water quality in the region. Principal point source loads and locations are listed along with the type and amount of pollutant each source discharges. Tactical solutions are offered based on particular situations and problems with a timetable and manpower schedule for instituting the proposed solutions. The report finishes by listing each discharger and the schedule for pollution reduction levels required by each to meet ambient water quality standards by FY '76. (Coan-NC)
W79-03149

ENVIRONMENTAL RESOURCES MANAGEMENT STUDIES OF THE KISSIMMEE RIVER BADSIN,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. C. Huber, J. P. Heaney, P. B. Bedient, and J. P. Bowden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 330, Price codes: A13 in paper copy, A01 in microfiche. Prepared for Central and Southern Florida Flood Control District, West Palm Beach, Final Report, May 1976. 296 p, 74 tab, 91 fig, 2 append.

Descriptors: *Water quality, *Water resources management, *Land use, *Florida, *Kissimmee River Basin(FL), *Environmental management, Land classification, Soil types, Agriculture, Soil moisture, Equitable apportionment, Drainage density, Hydrology, Agricultural runoff, Drawdown, Lakes, Swamps, Marshes, Water retention, Linear programming, Model studies.

The Kissimmee River Basin, located in the central portion of peninsular Florida between the Peace River Basin to the west and the St. Johns River Basin to the east, originates near Orlando, passes through a series of shallow lakes in its upper reaches, emerges as a channelized river south of Lake Kissimmee, and flows south into Lake Okeechobee. The report describes the transition of the Kissimmee River Basin from a status typified by natural vegetation with low intensity agriculture to one increasingly characterized by intensive agriculture and urbanization, with associated water quantity and quality problems. Management alternatives are considered in three phases: land use analysis, hydrologic and water quality analysis, and analysis of storage/treatment capabilities of natural systems. Land use changes are measured using a linear programming method which apportions land among different uses and over different soil types on basis of agricultural demands, costs and constraints; this method allows the researcher to project future land use patterns. Indices of environmental quality are measured by hydrologic and water quality responses in the river basin. Hydrologic analysis for the lower basin is performed by generating surface and subsurface runoff in the model HLAND, coupled to a Muskingum routing model for the Kissimmee River. Estimates of historical and projected quantity and quality of runoff from different land uses are offered. The relationship between drainage density and the quantity and quality of runoff is alos explored. Management for environmental quality in the last management phase--analysis of storage/treatment capabilities of the natural systems--focuses on maintaining high proportions of subsurface flow, high detention times, and upon utilization of natural marshes and swamps for water quantity and quality control. (Coan-NC)
W79-03150

NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION--1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES.
New England River Basins Commission, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 342, Price codes: A13 in paper copy, A01 in microfiche. Prepared for U.S. Water Resources Council, Washington, D.C., Technical memorandum 4, NER BC-77, November 1977. 309 p, 7 fig, 2 append.

Descriptors: Water quality, *Water quality control, *River basins, *Water resources, *New England, River Basin Commissions, Water consumption, Resources development, Land use, Flood damages, Eutrophication, Water supply, Interbasin transfers, Wetlands, Erosion, Water requirements, Regional planning, Resource assessment, Vessel discharges, Energy facility siting.

This report summarizes much of the work carried out through the New England Regional Assessment Program and presents the conclusions and recommendations developed in response to a final list of severe resource problems in New England. The New England Region encompasses 74,640 square miles and six states. Eighty percent of the region is forested; 10% is cropland, pasture and wetland; 5% is developed; and 5% is composed of streams and rivers. The region supports 12 1/2 million people with most of the population centers near the coast or on rivers. The report describes 23 significant environmental problems resulting from development and human activities; it outlines the objectives of government policies dealing with the problems; and offers recommendations to ameliorate the problems. The recommedations are divided into data collection needs, additional research areas, special studies and legal, institutional, and policy changes. Some of the problems are point source pollution, discharges from small vesse inappropriate land use, loss of prime agricultu land, loss of key historical and prehistorical sit and others. Tables are provided, listing the soci economic characteristics of the region, such population, total employment earnings, incom land use. Other tables list the water requiremen both withdrawal and consumptive use of fres water and saline water, for residential, industri and agricultural purposes; and flood damages a frequency of flooding. An identification and d cussion of 22 regional assessment problem areas provided with an in-depth listing of their enviro mental problems in tabular form. The proble areas are the major river basins and coastal zon throughout New England. (Coan-NC)
W79-03151

ENVIRONMENTAL POLLUTION CONTRO TWO VIEWS FROM THE GENERAL POPUL TION,
Kansas State Univ., Manhattan. Dept. of Politi Science.
P. Althoff, and W. H. Greig.
Environment and Behavior, Vol. 9, No. 3, p 4 456, September 1977. 2 tab, 20 ref.

Descriptors: *Attitudes, *Decision-making, *Soc values, *Pollution, *Environmental conce *Government policy, *Public opinion, Abateme Kansas, Environmental pollution control.

This study explored the opinions of a rand sample of the general population of the state Kansas concerning the environmental pollut controversy and how it should be dealt with. F clusters -- environmental concern, governmen trust, industrial trust, environmental protector, personal commitment, are formulated for the d and are used as the basis for the discussion findings. Respondents in each cluster were aske questions. Relationships between the five clust and 15 specific variables -- socioeconomic policy related issues-are presented. It was fo that the respondents were concerned about environmental issue, were not particularly trust of governmental and industrial efforts to solve pollution problem, were only somewhat dedica to environmental protection, and were relativ committed personally to aid in solving the pr lem. Those living in urban areas, who were yo ger and had higher levels of education and hig incomes tended to be more concerned about e ronmental issues, less trusting of both governm tal and industrial efforts, more personally comm ted to environmental aid in solving pollution pr lems and more dedicated to environmental prot tion than those living in small towns and r areas, who were older and had less education lower incomes. The authors indicate that the fi ings of the study may have severe implications the future of pollution control policy-maki (Arnold-NC)
W79-03154

RED RIVER OF THE NORTH BASIN.
Environmental Protection Agency, Denver, Region VIII
Available from the National Technical Informa Service, Springfield, VA 22161 as PB-255 Price codes: A07 in paper copy, A01 in microfi December 1972. 136 p.

Descriptors: *Water quality, *Water resources velopment, *Water pollution, *Waste water t ment. *North Dakota, *Red River of the N River Basin, *Red River Basin(ND), Colifo Biological oxygen demand, Dissolved oxygen, dustrial wastes, Total suspended solids, Sew Sewage treatment, Regional planning.

The Red River of the North River Basin enc passes portions of North Dakota, Iowa, Minnes and the Dominion of Canada. Because of River Basin involves three state governments, EPA regional jurisdictions, and the Canadian g ernment, pollution problems are extremely c plex. The area of primary effort for Region VI the State of North Dakota. The major indus pollution in the Basin stems from sugar beet

itions while other pollution problems are d by discharging wastewater effluent under esulting in high oxygen deficiences. Because dischargers release their wastes during spring all, which is also the peak time for sugar beet essing, a large slug loading is deposited upon ver system at these times. The report offers a rehensive assessment of pollutant loadings in ceiving waters in the Red River Basin and tactical solutions for what are viewed as r problems. Tables are presented showing basin loads of biological oxygen demand and suspended solids for fiscal years 1973, 1974, and 1976. Planned accomplishments are listed ronological order showing which specific ac- EPA administrators should take when solv- Red River pollution problems. A long section e report is devoted to point source loads and ions. These tables list principal dischargers, a of waste parameters and present loads of parameters, and loads for fiscal years 1973, 1975 and 1976. Also, information on the type aste treatment facility and effluent require- s is shown. The report ends by describing h actions dischargers should take to bring wastes in line with water quality standards. n-NC)
-03156

IRONMENTAL AND ECONOMIC PROB- IS ASSOCIATED WITH THE DEVELOP- NT OF THE BURNS WATERWAY BOR, INDIANA.
ptroller General of the United States, Wash- n, DC.
lable from the National Technical Information ice, Springfield, VA 22161 as PB-257 325, codes: A03 in paper copy, A01 in microfiche. ared for the Corps of Engineers, Washington, September 20, 1971. 44 p, 7 append.

riptors: *Water quality, *Industrial wastes, ter pollution, *Burns Waterway Harbor(IN), nes National Lakeshore Park(IN), Water pol- n effects, Water pollution abatement, Water ition control, Waste water pollution, Water rces development, Recreation, Transporta- Harbors, Environmental effects, Air pollu- Indiana, Economic development.

Burns Harbor Waterway is located on the e of Lake Michigan about 18 miles east of the ois-Indiana state line. The harbor is bordered he west by the Midwest Steel Division of onal Steel Corporation, and on the east by lehem Steel Corporation. The National Park ice (NPS), Department of the Interior, is ac- ng land on both sides of the harbor area for lopment of the Indiana Dunes National Lake- e Park. The report discusses the environmental economic problems associated with the devel- ent of the harbor as a transportation facility he two steel mills. It describes Indiana's air water pollution control programs and their ral inadequacy in controlling pollution in the or. The major deterrents to implementing ef- ve monitoring and control programs are the of financial resources and the need to gthen the air and water pollution control leg- on and regulations. The report also points out while control of water pollution is primarily a e responsibility, legal provisions allowing and uraging localities to establish air quality con- programs exist. Porter County, which has diction over the harbor and Dune areas, does have adequate legislation, financial resources, qualified personnel to control the problem. stions are raised concerning assurances made he State of Indiana regarding public terminal transfer facilities to be provided at the harbor. master plan showed an estimated cost of $38.6 on for these facilities. The major conclusion is pollution from existing and future develop- t in the Burns Harbor Waterway area, unless quately controlled, with have a detrimental ct upon the Dunes area. (Coan-NC)
-03157

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY. VOLUME I: MAIN REPORT.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03164

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME II, APPENDIX A: THE ECONOMY AND CHARACTER OF THE MERAMEC,
Washington Univ., St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03165

MERAMEC RIVER, MISSOURI. COMPREHENSIVE BASIN STUDY, VOLUME III. APPENDIX B: WATER NEEDS AND PROBLEMS,
Washington Univ., St. Louis, MO.
E. L. Ullman, R. R. Boyce, D. J. Volk, and B. T. Bower.
December 1961. 230 p, 5 chapters.

Descriptors: *Water resources, *Economics, *Flood damage, *Water supply, *Water quality, *Waste water disposal, *Recreation, *Meramec River(MO), Water requirements, Missouri, Economic efficiency, Cost-benefit analysis, Economic impact, Flood control, Flood data, Flood flow, Flood forecasting, Flood frequency, Flood plains, Flood protection, Non-structural measures, Water supply development, Cities, Industries, Ground water availability, Surface water availability, Waste disposal, Recreation demand, Recreation facilities, St. Louis(MO).

This Study was undertaken to devise a program for development of the Meramec Basin's water and related land resources to meet both short- and long-term needs. This volume deals with water needs and problems, and is comprised of five distinct chapters. The first deals with methods of economic analysis. Economic assumptions and procedures used in benefit-cost analyses are reviewed. Outputs and benefits from water resource systems are outlined, with special attention given to flood damage reduction, navigation, water supply and quality, fisheries, recreation and power. Ch. 2 is concerned with flood damage reduction. Both structural and non-structural methods are reviewed, flood problems assessed, benefits from flood damage reduction estimated, and future flood damage-discharge relationships outlined. Ch. 3 discusses municipal and industrial water supply. Water supplies in both the Meramec Basin and the St. Louis area are inventoried, as are the municipal and industrial water supply requirements in both the Basin and the St. Louis area. Ch. 4 is concerned with waste disposal and water quality. Sources of pollution in the Basin are identified, water quality is assessed, and the effect of increased streamflows is reviewed. Industrial wastes are inventoried. Ch. 5 deals with recreation. National trends are discussed, followed by an assessment of the demand for water recreation in the Basin. An estimation of benefits from basin reservoirs is provided, the impact of recreation on local economies and on the St. Louis area is presented, characteristics of needed recreation facilities are discussed and recreation needs for the Basin and St. Louis are summarized. (See also W79-03164) (Zayac-NC)
W79-03166

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME VII. APPENDICES M THROUGH S.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03170

COMMENTS ON ADVANCE COPY OF SUMMARY REPORT ON MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03172

EFFECT OF AN ORGANOPHOSPHORUS INSECTICIDE, ABATE, USED IN THE CONTROL OF SIMULIUM DAMNOSUM ON NON-TARGET BENTHIC FAUNA,
Ghana Inst. of Aquatic Biology, Achimota.
For primary bibliographic entry see Field 5C.
W79-03174

COST OF SOCIAL AND ENVIRONMENTAL REGULATIONS IN CONSTRUCTION,
Ohio Northern Univ., Ada.
E. Koehn, R. E. Benson, Jr., and D. Shank.
Journal of the Construction Division of the American Society of Civil Engineers, Vol. 104, No. 2, p 117-122, June 1978. 1 fig, 4 tab, 7 ref.

Descriptors: *Construction costs, *Pollution abatement, *Social aspects, *Regulation, *Environmental effects, *Opinion surveys, Costs, Industrial wastes, Federal government, Ohio, Construction, U.S. Environmental Protection Agency, Occupational Safety and Health Administration, Nuclear Regulatory Commission, Equal Employment Opportunity Commission.

Effects of environmental and social regulations of four governmental agencies on construction industry costs were assessed by means of an opinion survey of 400 large contractors in a list compiled by Engineering News-Record, and 476 smaller contractors listed in the Ohio Contractors Association Directory. The great majority of contractors (88% of the ENR 400 and 84% of the OCA group) said that social and environmental controls have measurable increased construction costs. About three-fourths of the respondents also felt that generally accepted construction practices satisfy requirements of the regulations. The weighted mean percentage of construction costs spent for social and environmental controls was 10.7% for the ENR 400 and 11.9% for the OCA group. The weighted and unweighted means were quite close for the ENR 400, indicating percentage allocated for controls does not vary greatly with the organizations's dollar value; this is not the case for the OCA group. A representative sample of comments taken from the questionnaires is included. Regulatory agencies considered in this paper are: the Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), Nuclear Regulatory Commission (NRC), and the Equal Employment Opportunity Commission (EEOC). Costs are itemized by agency. (Lynch-Wisconsin)
W79-03191

AN APPROACH TO THE OPTIMAL CONTROL OF POLLUTION IN BOUNDARY WATERS,
Guelph Univ. (Ontario). Dept. of Economics.
B. A. Forster.
Discussion Paper No. 77-10. 17 p, 3 fig, 21 ref.

Descriptors: *Water pollution control, *Boundary waters, *Optimization, *Economics, *Mathematical models, *International water, Boundaries(Property), Theoretical analysis, Model studies, Dynamic models, International Joint Commission, Canada, United States, Economic efficiency, Great Lakes, History, Treaties, International waters.

An aggregate model of pollution and economic activity developed by the author in a previous paper is modified to include two countries (such as Canada and the United States), facilitating analysis of problems involving pollution in international boundary waters. It is assumed that the two countries share a common waterway, such as the Great Lakes, which is polluted as a result of normal economic activity. A Bolza-Hestenes optimal control formulation involving an isoperimetric constraint was constructed and analyzed. The resultant strategy is dynamically Pareto efficient; it is not possible to make one nation better off without making the other worse off. Redistribution which takes place in the model does not involve real productive resources in a geographical sense; each country must live within its own production constraint. Redistribution takes place through the level

of pollution in the boundary water. The model assumes each country produces a fixed flow of output. Evolution of the pollution stock depends upon the size of the waste flow and the assimilative capactity of the waterway. A decay function is included. The Canadian-American International Joint Commission was established following signing of the Boundary Waters Treaty by Britain and the U.S. in 1909 (ratified by Canada in 1911). The IJC's initial focus on efficient use of boundary waters shifted in 1912 to concern for pollution. In 1972 the Great Lakes Water Treaty was signed. (Lynch-Wisconsin)
W79-03195

ELEVENTH HOUR AMENDMENT TO FWPCA RESUSCITATES EPA'S HAZARDOUS SUBSTANCE DISCHARGE PROGRAM,
For primary bibliographic entry see Field 6E.
W79-03205

THE FATE OF NON-COMPLIANT MUNICIPALITIES WITH REGARD TO THE SECONDARY TREATMENT STANDARDS PURSUANT TO THE 1972 FEDERAL WATER POLLUTANT CONTROL ACT AMENDMENTS - A PROBLEM OF ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W79-03208

CUSTOM AND LAND-BASED POLLUTION OF THE HIGH SEAS,
For primary bibliographic entry see Field 6E.
W79-03215

CONGRESS, THE COURT, AND WATER POLLUTION,
Chicago Univ. Law School, IL.
For primary bibliographic entry see Field 6E.
W79-03223

AGRICULTURAL WATER QUALITY ACT.
For primary bibliographic entry see Field 6E.
W79-03225

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PORTLAND, ME.).
For primary bibliographic entry see Field 6E.
W79-03226

OIL SPILL LIABILITY AND COMPENSATION.
For primary bibliographic entry see Field 6E.
W79-03228

OILSPILL CONTINGENCY PLAN.
For primary bibliographic entry see Field 6E.
W79-03231

PROTECTION AND ENHANCEMENT OF SOIL AND WATER RESOURCES.
For primary bibliographic entry see Field 6E.
W79-03234

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (FORT COLLINS, COLORADO).
For primary bibliographic entry see Field 6E.
W79-03236

IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT (REGULATION AND MONITORING OF TOXIC AND HAZARDOUS CHEMICALS).
For primary bibliographic entry see Field 6E.
W79-03237

MORSE V. OREGON DIVISION OF STATE LANDS (AGENCY OVERSTEPPED ITS AUTHORITY WHEN IT PERMITTED A LANDFILL FOR A NON-WATER-RELATED ACTIVITY).
For primary bibliographic entry see Field 6E.
W79-03238

DEPARTMENT OF TRANSPORTATION V. PSC RESOURCES, INC. (PROPERTY OWNER'S STANDING UNDER ENVIRONMENTAL RIGHTS ACT TO ENFORCE WATER QUALITY IMPROVEMENT ACT UPHELD),
For primary bibliographic entry see Field 6E.
W79-03242

INACTIVE AND ABANDONED UNDERGROUND MINES. WATER POLLUTION PREVENTION AND CONTROL,
Baker (Michael), Jr., Inc., Beaver, PA.
R. L. Scott, and R. M. Hays.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 263, Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA-440/9-75-007, June 1975. 293 p, 54 fig, 14 tab, 132 ref. 68-01-2907.

Descriptors: *Water pollution control, *Mine drainage, *Underground structures, *Acid mine water, Water quality control, Pollution abatement, Water pollution sources, Costs, Mineral industry, Mine wastes, Mine water, Metals, Nonmetals, Coal, Thorium, Uranium.

The chemistry and geographic extent of mine drainage pollution in the U.S. from inactive and abandoned underground mines is discussed; underground mining methods are surveyed. Mine drainage control technology, largely developed in eastern U.S. coal fields and not always applicable to other regions and other mineral mining, are classified into two main categories: (1) at-source and (2) treatment. At-source mine drainage pollution prevention and control techniques are evaluated and described according to the following classifications: water infiltration control; mine sealing; mining techniques; water handling; and discharge quality control. Appropriate cost data is related, examples technique implementation are given. A summary of the mineral commodities mined in the U.S. includes location and the environmental effects associated with mining them. An extensive bibliography is provided. (Davison-IPA)
W79-03247

CONTINGENCY PLAN FOR CONTROL AND TREATMENT OF ACCIDENTAL SPILLS OF TOXIC CHEMICALS FROM ELECTROPLATING PROCESSES,
Army Materiel Command, Texarkana, TX.
R. A. Raby.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A009 197, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. USAMC-ITC-02-08-75-216, March 1975. 45 p, 3 fig, 1 tab, 11 ref, 1 append.

Descriptors: *Spills, *Waste treatment, *Water pollution control, Toxicity, Industrial wastes, Liquid wastes, Water pollution treatment, Neutralization, Oxidation, Chemical reactions, Cyanide, Acids, Red River Army Depot, Texarkana, Texas.

Methods for treating spills of three types of electroplating process solutions are evaluated. Results of experiments using ferrous sulphate and sodium metabisulphate to treat hexavalent chrome verify their effectiveness. Treatment of cyanides by catalytic oxidation and alkaline chlorination yielded satisfactory results. Acids were neutralized with hydrated lime, soda ash, and caustic soda. A contingency plan for the electroplating shop at Red River Army Depot in Texarkana, Texas, to detect and treat spills is presented; a general discussion of this shop is included. (Davison-IPA)
W79-03248

CONTROL OF WASTE AND WATER POLLUTION FROM POWER PLANT FLUE GAS CLEANING SYSTEMS: FIRST ANNUAL R AND D REPORT,
Aerospace Corp., El Segund, CA. Environm and Energy Conservation Div.
P. P. Leo, and J. Rossoff.
Available from the National Technical Informat Service, Springfield, VA 22161 as PB-259 2 Price codes: A09 in paper copy, A01 in microfic Report No. EPA-600/7-76-018, October, 1976. p, 25 fig, 33 tab, 45 ref. 68-02-1010.

Descriptors: *Waste treatment, *Industrial was *Electric power plants, Water pollution sour Coal, Research and development, Projects, Wa reuse, Lime, Leaching, Water pollution cont Waste disposal, Water quality, Gypsum, Ferti ers, Waste identification, Chemical propert Physical properties, Power plants, Gases, claimed water, Ponds.

An assessment of the continuing research and velopment work in the field of coal-fired uti power plant flue gas cleaning (FGC) waste tr ment, disposal, and utilization is presented. Ove power plant water recycle and reuse is include the assessment. Results from 19 projects cover following: (1) chemical and physical character tion of wastes from eastern and western U.S. pl using lime, limestone, or double-alkali scrubb systems; (2) chemical and physical properties leaching characteristics of treated and untrea wastes; (3) field evaluations of treated and untr ed waste disposal; (4) disposal and utilization al natives; (5) cost estimates for ponding and fixation disposal methods; (6) disposal standa (7) gypsum production and marketing; (8) poten use of wastes in fertilizer and portland cem production; and (9) beneficiation studies. The sults from this program will be used to provid data base for defining waste disposal standards predicting effects on ground and surface w quality. (Davison-IPa)
W79-03251

CONSTRUCTION GRANTS PROGRAM FORMATION: INDUSTRIAL COST REC ERY SYSTEMS,
Environmental Protection Agency, Washing DC. Municipal Construction Div.
Report No. MCD-44, November 1976. 62 p, 22 4 append.

Descriptors: Publications, *Waste treatm *Treatment facilities, *Cost allocation, Fed project policy, Cost repayment, Project plann Grants, Financing, Industrial cost recovery tems.

Supplemental information describing the esse requirements of the 'Federal Guidelines- Indus Cost Recovery Systems' (ICR) and descri other related requirements is presented. Use of information will assist grantees in the design, in lation and implementation of their systems. A f chart traces the relationships of the ICR and charge systems; major requirements of the gu lines are referenced. The development of an system is described and industrial users are ide fied and classified to determine financial data ICR payments. Funds management systems discussed, and examples of various records given. A check list is provided to assist the gra in completing system requirements within the essary time. (Davison-IPA).
W79-03252

A STUDY OF COAL-ASSOCIATED WAS RESULTING FROM THE MINING, PROCE ING AND UTILIZATION OF COAL,
West Virginia Univ., Morgantown. Coal Reser Bureau.
Quarterly Report No. 15, Report No. FE-121 January 1976. 13 p, 3 fig, 1 tab. E (49-18)-1

Descriptors: *Mine wastes, *Waste treatment, cycling, *Coal mine wastes, Acid mine drain Research and development, Testing, Fly ash, C Copper, Byproducts, Concretes, Concrete tives.

sults continuing research on waste byproducts ociated with coal utilization and conversion is orted. Simple water leaching of the minerals not solve the problem of efflorescence or 'sum- g' which is due to the presence of soluble nerals in fly ash based fired structural products. cent work to develop a mixing procedure for production of aerated concrete comparable to ropean products involved the development of a thod of distributing aluminum powder evenly oughout the sample. Test results indicate that mixing the powder and water produces a mple of higher quality than previous methods. search efforts in recovering copper from acid ne drainage (AMD) sludge have examined the itations of the individual process steps, which ulted in a better understanding of this potential ization plan. (Davison-IPA).
79-03255

ALUATION OF SOURCES OF ODOR POL- TION IN AN AREA OF KANSAS CITY, MIS- URI.
dwest Research Inst., Kansas City, MO.
ailable from the National Technical Information rvice, Springfield, VA 22161 as PB-259 868, ce codes: A03 in paper copy, A01 in microfiche. al Report, 1974. 41 p, 4 fig, 11 tab. 3701-C, 68- 0453.

scriptors: *Air pollution, *Pollutant identifica- n, *Odor, Industrial effluents, Laboratory tests, s chromatography, MRI Fingerprint method, mpling, Analytical techniques, Urban areas, Air vironment, Air pollution effects, Kansas City, ssouri.

evaluation of potential odor sources in Kansas y, Missouri, was accomplished by utilizing the dwest Research Institute 'fingerprint' method. e 'fingerprint' method involves: (1) collection of oncentrated sample of the volatile contents pres- in the air during an odor episode; (2) collection samples in the air upwind and downwind of h potential odor source; and (3) separating the nstituents of each sample by gas-liquid chroma- graphy (GLC). Flame ionization detection was d with GLC separation. The best separation s obtained by SF-96 and FFAP columns. Back- ound samples and source samples were collected m five potential odor sources. Source sample alyses were compared with background sample alyses to identify the specific sources of the odor mplaints. One complaint sampling contained ef- ent from four sources; the major contributions re Chemagro Corporation and Conservation emical Company. In all odor episodes analyzed, se two companies were the major contributors; luent from American Oil Corporation was a nor contributor during one episode. (Davison- A)
79-03256

HEMICAL ANALYSIS OF INTERSTATE ARRIER WATER SUPPLY SYSTEMS,
vironmental Protection Agency, Washington, C.
r primary bibliographic entry see Field 5A.
79-03259

CHOOL WATER SUPPLY FLUORIDATION,
vironmental Protection Agency, Washington, C. Office of Water Supply.
r primary bibliographic entry see Field 5F.
79-03260

ETHANOL TREATED ACTIVATED SLUDGE S AN AGRICULTURAL CHEMICAL CARRI- R,
epartment of Agriculture, Washington, DC.
ne 17, 1976. 34 p, 13 tab.

escriptors: *Agricultural chemicals, *Chemcon- ol, *Application method, *Activated sludge, Pes- cides, Fertilizers, Plant growth regulators, Water llution control, Sprays, Granules, Seed treat- ent, Soil treatment, Methanol, Sludge.

A method for the controlled, sustained release of agricultural chemicals to their target organisms is described. The method employs a methanol treated activated sludge carrier, and has application in forming sprayable films, granular pellets, and seed coatings, resistant to the natural mechanisms of chemical loss. Pesticides and fertilizers, normally applied directly to the soil, plant foliage or an inert carrier are particularly suitable for use with this method. (Davison-IPA).
W79-03262

GUIDANCE FOR PREPARING A FACILITY PLAN, MUNICIPAL WASTEWATER TREATMENT WORKS, CONSTRUCTION GRANTS PROGRAM,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 652, Price Codes: A04 in paper copy, A01 in microfiche. Report No. MCD-46, May 1975. Supercedes 'Guidance for Facilities Planning, 'January 1974. 62 p, 26 ref, 3 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Municipal wastes, *Federal Water Pollution Control Amendments, *National Environmental Policy Act, Planning, Legal aspects, Publications, Regulation, Grants, Government finance, Design criteria, Cities.

Suggested procedures for preparing a facility plan for publicly-owned treatment works are presented. This plan is the first stage in a three stage process required of a municipality desiring a Federal grant under the Federal Water Pollution Control Amendments of 1972 (FWPCA) to construct a treatment works. Requirements and regulations contained in the two major laws, FWPCA and the National Environmental Policy Act (NEPA), are described. The following areas are discussed in detail: (1) facility plan; (2) public participation; (3) evaluation of costs; (4) environmental evaluation; (5) plan selection; (6) format for plan submission; and (7) review, certification and approval of plans. The construction grant regulation is provided in appendix B. (Davison-IPA)
W79-03263

ALTERNATIVE INSTITUTIONAL AND FINANCIAL ARRANGEMENTS FOR AREAWIDE WASTE TREATMENT MANAGEMENT,
Banks (Harvey O.) Consulting Engineer, Inc., Belmont, CA.
H. O. Banks, and H. J. Owen.
Available from the National Technical Information Service, Springfield, VA. as PB-253 318, Price Codes: A 08 in paper copy, A01 in microfiche. January 1974. 175 p, 2 fig, 5 tab, 105 ref, 2 append. 68-01-2909.

Descriptors: *Waste treatment, *Project planning, *Financing, *Management, Water quality, North Carolina, Ohio, Maine, Water resources development, Comprehensive planning, Regional development, Water law, Water requirements, Water Quality Control Act.

Results of a study to identify and describe components inherent in selecting institutional and financial arrangements which might be used in implementing areawide waste treatment management plans are reported. The related tasks of the study included a literature review, case study investigations, a comparative analysis of the case study findings, and the preparation of recommendations. The case study areas selected represent a wide range in the following: water quality problems to be solved, existing institutional framework, geographic location, and character of the planning area. It was generally concluded that adequate information can be obtained at the inception of the planning process to identify the depth and detail of institutional and financial studies requisite to developing areawide waste treatment management plans. Thrity general conclusions and recommendations, for the case study areas are presented. Institutional and financial aspects of areawide waste treatment management are detailed and case studies invoving the areas of Youngstown, Ohio, Raleigh - Durham, North Carolina, and Southern Maine are reported. (Davison-IPA)
W79-03265

SURVEY OF METHODS USED TO CONTROL WASTES CONTAINING HEXACHLOROBENZENE,
TRW Systems, Inc., Redondo Beach, CA.
For primary bibliographic entry see Field 5E.
W79-03266

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR ALDRIN/DIELDRIN MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W79-03267

NOMOGRAPHS FOR TEN-MINUTE UNIT HYDROGRAPHS FOR SMALL URBAN WATERSHEDS,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
For primary bibliographic entry see Field 6B.
W79-03272

URBAN RUNOFF CONTROL PLANNING,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
For primary bibliographic entry see Field 6B.
W79-03273

THE PESTICIDE CONTENT OF SURFACE WATER DRAINING FROM AGRICULTURAL FIELDS--A REVIEW,
Science and Education Administration, Stoneville, MS. Southern Weed Science Lab.
For primary bibliographic entry see Field 5B.
W79-03289

OIL BOOM,
British Petroleum Co. Ltd., London (England). (Assignee).
M. G. Webb.
U.S. Patent No. 4,112,689, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 624, September 12, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, Water quality control, Barriers, Floating, Weirs, Equipment, *Oil booms, Containment(Wastes), Oil recovery.

A barrier for the containment and recovery of oil spilt on water comprises at least one elongated, flexible buoyant chamber, at least one elongated, flexible ballast water chamber and at least one further flexible water chamber of greater buoyancy than the ballast chamber. The buoyant chamber and the further water chamber are each joined to the ballast water chamber in side by side relationship and the chambers are so positioned relative to one another that when in use on water the buoyant chamber and the ballast water chamber together form a barrier for oil spilt on water. The further water chamber defines a weir between itself and the other chambers and the weir is provided with means to remove oil and water. (Sinha - OEIS)
W79-03311

APPARATUS FOR SEPARATION OF OIL FROM OIL AND WATER MIXTURES,
Simon-Hartley Ltd, Stoke-on-Trent (England).
K. H. Toft.
U.S. Patent No. 4,115,279, 4 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, No. 3, p. 1492, September 19, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, Water quality control, Separation techniques, Laminar flow, Equipment, Ballast water.

An apparatus separates oil from a mixture of oil and water. A stream of the mixture is directed along an upwardly inclined inverted channel. The apparatus is designed to direct the intended rate of flow of liquid to ensure that liminar flow takes place. As the mixture flows upwardly globules of oil form, float to engage the under-surfaces and become trapped in the apices of the inverted channels and thus are separated from the remainder of the stream. The length of the structure is such as to ensure that substantially all the oil contained within the mixture is separated by the time the mixture reaches the upper end. The oil is collected from the upper longitudinal end of the channel and the remainder of the stream is allowed to fall downwardly out of the channel. (Sinha - OEIS)
W79-03327

DEPLOYABLE BARRIER APRON APPARATUS FOR USE WITH CONTAMINANT RECOVERY SYSTEMS,
Oil Spill Recovery, Inc., Northbrook, IL. (Assignee).
M. D. Stagemeyer.
U.S. Patent No. 4,116,007, 7 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 974, No. 4, p. 1758, September 26, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Barriers, Water pollution control, Water pollution treatment, Water quality control, Floating, *Containment(Wastes), Contaminant recovery, Deployment.

A readily deployable barrier apron is used with contaminant recovery systems to encompass contaminant material or to channel such material to collection devices. An upper apron member which is impenetrable has a lower penetrable member attached. Deployment devices such as hinging segments or spooling rolls of such apron barrier are utilized with an uprighting construction to provide for a quickly deployable, ready to use, and easy to control barrier construction for such uses as the containment of oil spills. (Sinha - OEIS)
W79-03328

METHOD OF REGULATING THE GROWTH OF AQUATIC WEEDS WITH PYRIDINE DERIVATIVES,
Lilly (Eli) and Co., Indianapolis, IN. (Assignee).
For primary bibliographic entry see Field 4A.
W79-03329

METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM BODIES OF WATER,
Oil Spill Recovery, Inc., Northbrook, IL. (Assignee).
M. D. Stagemeyer, and S. F. Allcorn.
U.S. Patent No. 4,116,833, 11 p, 16 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, no 4, p 2030, September 2€, 1978.

Descriptors: *Patents, *Oil spills, *Skimming, *Barriers, Water quality control, Water pollution treatment, Equipment, Contaminant recovery, *Oil pollution.

A method and apparatus for removing petroleum and other spilled contaminant materials from the surface of a body of water is described. An open-ended barricade is directed into and about a contaminant mass to channel the contaminant material to skimming apparatus which assists in collecting the material for recovery, storage and reuse. The process and apparatus is especially adaptable for use in naturally flowing bodies of water into which the apparatus is restrainably positioned to continuously and automatically remove the contaminant material. By maneuvering the outermost ends of the barricade, it can be formed into funneling means for converging the material toward the collection area. (Sinha - OEIS)
W79-03332

POLLUTION CONTROL SYSTEM,
Savage Technical Services, Inc., Clark, NJ. (Assignee).
A. B. Bertelson.
U.S. Patent No. 4,116,835, 7 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 974, No 4, p 2031, September 26, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Oil pollution, *Water pollution treatment, Separation techniques, Coalescence, Adsorption.

Oil and other contaminants are separated from aqueous effluents by a system which includes means for introducing the contaminated effluents into a separation zone where they are passed through the labyrinth course of a coalescing chamber to separate oil particles. The oil is removed by means of a skimmer and moved into an oil storage area. The aqueous effluents are then passed from the bottom of the separation zone to an extraction zone where they are passed through a bed of a material capable of adsorbing hydrocarbons and other pollutants. The effluent may then be discarded or may be moved through a fail safe system designed to assure that hydrocarbon removal is complete in all instances. (Sinha-OEIS)
W79-03334

MECHANICS OF A RESTRAINED LAYER OF FLOATING OIL ABOVE A WATER CURRENT,
Massachusetts Inst. of Tech., Cambridge.
J. H. Milgram, and R. J. Van Houten.
Journal of Hydronautics, Vol 12, No. 3, p 93-108, July 1978. 20 fig, 1 tab, 15 ref.

Descriptors: *Oil pollution, *Barriers, *Shear stress, *Currents(Water), Water pollution effects, Oil-water interfaces, Outer Continental Shelf, Water currents, Dynamic pressure.

The relative importance of interfacial shear stress and dynamic pressure in determining the thickness distribution of a layer of floating oil contained by a barrier above a water current is determined. This is done by use of an equation relating vertical location of the oil-water interface, dynamic pressure, and shear stress. The interfacial shape is measured experimentally. The dynamic pressure is determined by numerical solution of the potential flow problem for flow beneath the measured shape. The aforementioned equation then yields the shear stress distribution. The rear portion of restrained oil layers are found to governed by shear stress as are the forward portions for low current speeds. At higher current speeds, both dynamic pressure and shear stress are important in determining the shape of the forward portions. Large friction coefficients are shown to be due to flow over a rough interface resulting from the generation of Kelvin-Helmholtz waves on the interface. The entrainment of oil droplets into the water flow is shown to be the result of breaking of the Kelvin-Helmholtz waves. (Sinha-OEIS)
W79-03373

APPLICATIONS OF SEASAT TO THE OFFSHORE OIL, GAS, AND MINING INDUSTRIES,
Battelle Columbus Lab., OH.
A. G. Mourad, and A. C. Robinson.
Journal of Hydronautics, Vol 12, No 4, p 137-141, October 1978. 1 fig, 1 tab, 8 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Oil spills, *Mining, Gases, Water pollution, Resources development, Environmental effects, Monitoring, *Outer Continental Shelf, *Seasat-1, Offshore industries.

Seasat-1, a NASA satellite launched in June 1978, was designed to provide synoptic, repetitive data on the ocean areas of the world. Seasat-1 carries five sensors, four with all-weather capability. The principal data products will be surface wind speed and direction, ice characteristics, and ice movement. One of NASA's objectives is to demonstrate Seasat capability and to permit evaluation of the practical value of the data to offshore industry users. Thus, this paper describes several industrial experiments planned by NASA during the operation of Seasat-1. These experiments are to be conducted with several industries, including oil, gas and mining organization which will be investigating the usefulness of the data. Applications include (1) improvements in weather and wave forecasts, (2) improved knowledge of past wind and wave statistics for setting design requirements, and (3) monitoring ice formation, breakup, and movement in arctic regions. A number of geographical areas are being examined, including the Beaufort Sea, Labrador Sea, Gulf of Mexico, U.S. East Coast, West Africa, Equatorial East Pacific, Bering Sea, and the North Sea. These investigations are being done jointly by NASA and the participating industrial organizations. NASA will provide the appropriate Seasat-derived data, and the industrial organizations will compare these data with their own observations and estimate the usefulness to offshore operations. Results will be available to the entire offshore industry and to the general public once the evaluations are completed. (Sinha-OEIS)
W79-03374

OCS OIL AND GAS: AN ASSESSMENT OF THE DEPARTMENT OF THE INTERIOR ENVIRONMENTAL STUDIES PROGRAM,
National Academy of Sciences-National Research Council Washington, DC. Committee on Natural Resources.
For primary bibliographic entry see Field 6G.
W79-03376

AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS,
Engineering-Science, Inc./Texas, Austin.
For primary bibliographic entry see Field 5B.
W79-03377

FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY. RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5B.
W79-03378

THE LEGAL ASPECTS OF POLLUTION -- THE UK PICTURE WITH E.E.C. COMPLICATIONS,
British Paper and Board Industry Federation, London (England).
For primary bibliographic entry see Field 6E.
W79-03388

ENVIRONMENTAL PROTECTION ON CANADA'S WEST COAST,
Beak Consultants Ltd., Vancouver (British Columbia).
J. E. G. Sikes, and L. E. Harris.
Paper (London), World Development Number, p 23, 27-29, 66, 1978. 3 illus, 2 tab.

Descriptors: *Pulp and paper industry, *Canada, *Water pollution control, *Air pollution control, Governments, Federal government, Water pollution sources, Waste water treatment, Waste treatment, Costs, British Columbia, Regulation, Legislation, Effluents, Discharge(Water).

Air and water pollution control by the 25 pulp and paper mills in British Columbia (Canada) is discussed, viz., the working relationships with the provincial and federal environmental regulatory agencies, effluent discharge guidelines, effluent treatment procedures (both external and in-plant), and expenditures since 1970. (Swichtenberg-IPC)
W79-03403

POLLUTION CONTROL REGULATIONS AND MONITORING TECHNOLOGY: A REVIEW OF RESEARCH AND DEVELOPMENT FROM THE PULP AND PAPER INDUSTRY,

Victoria Univ. (British Columbia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-03410

APPLYING THE CLEAN WATER LAW TO SOUTHEAST FORESTRY,
Soil Conservation Service, Atlanta, GA.
A. J. Dornbusch, and A. B. Herndon.
Southern Journal of Applied Forestry, Vol. 2, No. 1, p. 74-77, August, 1978. 1 fig, 4 ref.

Descriptors: *Water law, *Forestry, Water pollution, Forest management, Federal water pollution control act, Legislation, Water quality act, United States.

Control of any water pollution from forest management is required by the Federal Water Pollution Control Act (PL 92-500). Voluntary programs are acceptable in the Southeastern United States. Plans developed under Section 208 of the Act must include best land management practices, priorities, implementation schedules, evaluation programs, and reporting systems. A key factor is the assessment of types and locations of any water quality problems. Failure of voluntary plans after several years trial may require regulatory approaches to be taken. (Witt-IPC)
W79-03413

IMPROVE IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,
Colorado State Univ., Fort Collins. Dept. of Economics.
P. C. Huszar, and M. B. Sabey.
Water Resources Bulletin, Vol. 14, No. 4, p 978-987, August 1978. 3 fig, 1 tab, 5 ref.

Descriptors: *Irrigation, *Return flow, *Rental market, *Water quality, *Improvement, *Yakima River valley(Wash), Water allocation(Policy), Crop production, Economic efficiency, Water pollution, Water rights, Linear programming, Mathematical models, Benefits, Costs, Supply schedule, Opportunity costs, Water transfer, Systemsanalysis, Washington.

Current policies for correcting the problem of irrigation return flow pollution tend to attack the symptoms of the problem, rather than its cause. The present institutional arrangement for allocating irrigation water is seen as the source of the problem. This paper examines the water quality benefits of altering the institutional arrangement to allow for irrigation water transfers through a rental market. It is conceptualized that by creating a water rental market, an opportunity cost would be associated with the use of irrigation water such that profit maximizing farmers would be induced to use their water supplies more efficiently and rent the surplus to other irrigatiors, thus reducing return flow pollution. It is shown that a water rental market could improve water quality in the Yakima River in southcentral Washington by 31 percent as well as increase farm incomes and crop production. (Bell-Cornell).
W79-03420

LAKE QUALITY DISCRIMINANT ANALYSIS,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 5C.
W79-03422

POTENTIAL USE OF FINELY DISINTEGRATED IRON PYRITE IN SODIC AND IRON-DEFICIENT SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-03423

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,
Instituto Venezolano de Investigaciones, Cientificas, Caracas. Lab. de Ingenieria Ambiental.
D. T. O'Laoghaire.
Water Resources Bulletin, Vol. 14, No. 4, p 809-826, August 1978. 1 fig, 4 tab, 34 ref.

Descriptors: *Water quality, *Management, *Optimization, *Algorithms, *Capacity expansion, *Cost minimization, Capita costs, Investment, Linear programming, Integer programming, Operating rules, River basins, Computer programs, Constraints, Dissolved oxygen, Treatment facilities, Equations, Mathematical models, Systems analysis, Developing countries.

Described is a mathematical model, an algorithm, and a computer program that were specially developed to study the problem of a water quality management system undergoing a rapidly increasing environmental stress. The model output will determine the locations, sizes and timing of construction of new treatment plants plus an overall treatment plant operating policy so that environmental standards are maintaned at a minimum cost. The model, as formulated, is a 0-1 mixed integer programming problem which is solved by decomposing it into a capital budgeting problem (solved by Little's branch and bound algorithm) and an operational policy problem (solved by linear programming). The coded algorithm (in FORTRAN 10) has been tested with a semi-realistic example. (Bell-Cornell)
W79-03425

ECONOMICS OF MINED LAND RECLAMATION AND LAND-USE PLANNING IN WESTERN STATES,
Argonne National Lab., IL.
For primary bibliographic entry see Field 6B.
W79-03433

SALT OUTFLOWS FROM NEW AND OLD IRRIGATION LANDS,
Snake River Conservation Research Center, Kimberly, ID.
For primary bibliographic entry see Field 3C.
W79-03442

THE BIOGEOCHEMISTRY OF HEAVY METALS IN POLLUTED LAKES AND STREAMS AT FLIN FLON, CANADA, AND A PROPOSED METHOD FOR LIMITING HEAVY-METAL POLLUTION OF NATURAL WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W79-03449

REGISTRATION OF THIRTY-THREE FISHERY CHEMICALS: STATUS OF RESEARCH AND ESTIMATED COSTS OF REQUIRED CONTRACT STUDIES,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
R. A. Schnick, and F. P. Meyer.
Department of the Interior, Investigations in Fish Control No. 86, 1978, 19 p, 7 ref, 2 append.

Descriptors: *Research priorities, *Fish diseases, *Aquiculture, Monitoring, *Piscicides, *Lampricides, Collecting aids, Therapeutants, Disinfectants, Pond sterilants, *Herbicides, *Algicides, Anesthetics, Antimycin, Bayer 73, TFM, G-D-174, Rotenone, Squoxin, Thanite, Betadine, Calcium hypochlorite, Formalin, Furanace, Furazolidone, Hyamine 1622, Lime, Malachite green, Masoten, Nitrofurazone, Potassium permanganate, Sulfadimethoxine, Sodium chloride, Ormetroprim, Sulfamenazine, Terramycin, Copper sulfate, 2,4-D, Dichlobenil, Diquat, Diuron, Endothall, Fenac, Silvex, Simazine, MS-222, Quinidine sulfate.

An estimated $8.8 million for contract studies is needed to meet registration requirements for 33 chemicals now used or being considered for use in fish culture and management. Information given for each chemical includes its sponsor, current registration status, research situation in six categories (toxicities to target and nontarget organisms, field testing, physiological studies, analytical methods development, counteraction, and mammalian safety determination), costs of required contract studies, and the prognosis for registration of the use of each compound. (EIS-Katz)
W79-03452

WATER + WEEDS + HEAT = NOVEL EXPERIMENTATION,
Beak Consultant Ltd., Calgary (Alberta).
J. Crosby-Diewold, and J. B. Railton.
Canadian Water Resources Journal, Vol 3, No 3, p 62-77, 1978. 5 fig, 3 tab, 8 ref.

Descriptors: *Thermal powerplants, *Water quality standards, *Cooling water, *Thermal pollution, *Canada, Cooling, Thermal stress, Heated water, Water temperature, Effluents, Water pollution sources, Water pollution effects, Aquatic weeds, Aquatic weed control, Plant growth, *Thermal effluent, Elodea.

Two thermal power plants exist on the northern and southern shores of Lake Wabamun in central Alberta. A comparison of their respective cooling systems is given. The sequence of governmental decisions leading to the macrophyte studies is elaborated and some of the results are given. A generalized outline of environmental impacts is also given. Possible alternative modes of cooling and their respective capital and operating costs are discussed. (EIS-Deal)
W79-03456

USE OF 'BIOPOND SLUDGE' AS A FEED INGREDIENT FOR PEN-REARED COHO SALMON,
Weyerhauser Co., Seattle, WA.
K. Rile, and B. Allee.
In: 26th Annual Northwest Fish Culture Conference, Dec 3-5, 1975, Otter Rock, Oregon, p 129-130, 2 tab, 1 ref.

Descriptors: *Aquiculture, *Water treatment, *Salmon, Growth, *Sludge, Sludge disposal, Fish culture, Protein, *Pulp and paper, Industry, *Pulp wastes, Fish diets, *Biopond sludge, Coho salmon, Fish establishment, Fish physiology.

The sludge from pulping processes is high in protein. The dried sludge was incorporated in diets for salmon. Preliminary observations show that fish will eat and grow on this diet and that further research is indicated. (EIA-Katz)
W79-03474

ACCLIMATION TEMPERATURE AND TEMPERATURE TOLERANCE IN FINGERLING LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
North Texas State Univ., Denton. Dept. of Biological Sciences.
B. J. Venables, L. C. Fitzpatrick, and W. D. Pearson.
Environmental Pollution, Vol 17, p 161-165, 1978. 1 fig, 7 ref.

Descriptors: *Bass, *Heat resistance, *Thermal pollution, Water temperature, Heated water, Fry, Mortality, *Thermal powerplants, Fish physiology, Growth stages, Water pollution effects, Intakes.

Survival of test temperatures from 10 to 40C (5C intervals) was directly dependent on acclimation temperature for largemouth bass fingerlings which demonstrated 100% 48 h survival of instantaneous ambient temperature changes as great as 20C. Direct mortality of fingerling bass due to power plant discharges seems unlikely. (EIS-Deal)
W79-03496

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SOME LOCAL ECONOMIC IMPACTS OF THE MISSOURI RIVER RESERVOIRS WITHIN SOUTH DAKOTA (EFFECTS OF CONSTRUCTION, RECREATION, AND IRRIGATION AS REVEALED BY ANALYSIS OF SECONDARY DATA),
South Dakota State Univ., Brookings. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-03001

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASES II AND III,
Pennsylvania State Univ., University Park. Coll. of Health, Physical Education, and Recreation.
For primary bibliographic entry see Field 6B.
W79-03004

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 6G.
W79-03043

OPTIMIZATION MODEL FOR THE EVALUATION OF FLOOD-CONTROL BENEFITS OF MULTIPURPOSE MULTIRESERVOIR SYSTEMS,
Texas Univ. at Center for Research in Water Resources.
D. T. Ford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 638, Price codes: A11 in paper copy, A01 in microfiche. Publication No 158, 1978. 247 p, 25 fig, 10 tab, 4 exh, 62 ref, 4 append. OWRT C-6268(5224)(1).

Descriptors: *Flood control, *Economic evaluation, *Systems analysis, Estimated benefits, Reservoir storage, Reservoir releases, Reservoir operation, Multiple-purpose reservoirs, Water management(Applied), Frequency analysis, Optimization, Operations research, Network flow programming, *Arkansas River system.

A methodology is described for quantifying the demand for flood-control in a multipurpose reservoir system and for evaluating the expected benefits of satisfying that demand as a function of beginning-of-period storage, thereby permitting analysis of multipurpose operation with a suitably long computation interval. The methodology is executed in three major steps: (1) analysis of the frequency of natural flows and evaluation of the associated damages to develop damage frequency curves, (2) evaluation of the frequency of damages inccurred by regulated flows for various states of system storage via application of an operation optimization model, and (3) integration of the resulting damage frequency curves to determine the expected flood-control benefits. The optimization model used is a linear programming model, formulated with emphasis on selection of operation rules that are acceptable in practice. Specific limitations imposed on flood-control operation of reservoirs by the Corps of Engineers are incorporated explicitly in this model, both as constraints and as terms of the objective function. Additional goals and priorities of operation are specified with penalty coefficients in the objective function. A special case of the linear programming model, the network flow programming model, is presented, and its application is discussed. The benefit evaluation methodology is demonstrated by application to reservoirs of the Arkansas River system. Additional applications of the benefit evaluation methodology and the operation optimization model are suggested. Modifications and improvements are proposed.
W79-03044

IMPACT OF HYDROLOGIC UNCERTAINTIES ON FLOOD INSURANCE,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6F.
W79-03053

ANALYZING HYDROLOGIC UNCERTAINTY AND ITS IMPACT UPON DECISION MAKING IN WATER RESOURCES,
Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-03081

ASPECTS OF PRESENT HYDROLOGICAL AND WATER QUALITY MODELLING,
Karlsruhe Univ. (Germany, F.R.). Inst. fuer Siedlungswasserwirtschaft.
R. G. Cembrowicz, H. H. Hahn, E. J. Plate, and G. A. Schultz.
Ecological Modelling, Vol. 5, No. 1, p 39-66, June 1978. 8 fig, 3 tab, 37 ref.

Descriptors: *Model studies, Hydrology, *Water quality, *Optimization, *Simulation analysis, Systems analysis, Dynamic programming, Linear programming, Mixed-integer programming, Flow, Planning, Stochastic processes, Macro-elements.

Summarized is the 'state-of-the-art' of concepts and applications in the international development of water quality and hydrology modeling. Study information was obtained from publications, project reports, personal interviews, and discussions. Investigated were 41 models from 11 different countries, 20 emphasizing hydrological aspects, 18 focussing on water quality, and 3 incorporating both hydrology and quality. Established were general principles of model analysis for comparison and presentation. So-called 'macro-elements,' comprising input, systems analysis formulation, algorithm, and output were identified. 'Micro-elements' were defined, denoting typical analytical units within the models. Part A of the report focusses on hydrological models; introduced were three model classes, according to purpose, data requirements, and model structures, viz.: computation of runoff data; optimal operation of regional water resources systems; and optimization of the design of hydraulic structures. In part B, focussing on water quality, the more traditional approach of a descriptive analysis of the self-purification process in rivers were explored in several directions. Considered were: data fitting of lump-sum observations; detailed empirical formulation of processes; food-chain simulation; and stochastic water quality analysis. Formal optimization routines employed in quality control emphasize linear, mixed-integer, and dynamic programming, the trend showing a desirable feedback between optimization and simulation. Mathematical modeling of hydrological and water quality phenomena has become an indispensable tool for environmental control and enhancement. (Bell-Cornell)
W79-03082

PROCEEDINGS OF A WORKSHOP ON MODELLING OF WATER DEMANDS.
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W79-03083

PROCESS MODELLING USING LINEAR PROGRAMMING,
Houston Univ., TX.
For primary bibliographic entry see Field 6D.
W79-03086

SYSTEMS ANALYSIS APPLIED TO AGRICULTURAL WATER DEMAND,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W79-03087

REGIONAL WATER SUPPLY FUNCTIONS,
International Inst. for Applied Systems Analysis, Laxenburg, (Austria).
I. Gouevsky.
In: Proceedings of a Workshop on Modelling of Water Demands, 17-21 January, 1977, Laxenburg, Austria. J. Kindler, Ed., International Institute for Applied Systems Analysis, CP-78-6, Laxenburg, Austria, June 1978, p57-67. 2 fig, 10 ref.

Descriptors: *Alternative planning, *Evaluation, *Regional analysis, *Water supply, *Supply function, *Cost minimization, Constraints, Water demand, Methodology, Linear programming, Nonlinear programming, Equations, Mathematical models, Systems analysis, Marginal cost.

Considered is a method to evaluate water supply alternatives in a region and to appropriately combine them to meet projected water demands. A useful extension of physical system analysis utilizes water supply functions, which give the amounts of water that could be made available at various cost increments. Considered first is the problem of developing a general scheme for water supply in a particular region. Next, the key idea in deriving a supply function, different supply alternatives, and the resource inputs required for each, are substituted for each other until the least-cost combination for producing any desired amount of water is found. The standard formulae for input demand are deduced and the marginal cost derived. Provided is a methodological framework for finding water supply functions through a nonlinear program. However, in many practical situations, it is reasonable to have the application of the methodology in the form of a linear program. Work in this area could benefit from considering how to introduce nonlinearities, especially those resulting from economies of scale, in as painless a fashion as possible. The dynamics of water supply need to be considered. (See also W79-03083) (Bell-Graf--Cornell)
W79-03088

INTER-DISTRICT WATER ALLOCATIONS VIA LINEAR PROGRAMMING AND LINEAR PROGRAMMING DECOMPOSITION,
Iowa Univ., Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W79-03091

A NONLINEAR PROGRAMMING ALGORITHM FOR REAL-TIME HOURLY RESERVOIR OPERATIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W79-03093

OPTIMAL PLANNING FOR URBAN STORM DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
S. A. Dendrou, J. J. Talavage, and J. W. Delleur.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers. Vol 104, No. WR1, November 1978. p 17-33, 5 fig, 2 tab, 16 ref, append. OWRT B-083-IND (9).

Descriptors: *Urban drainage, *Drainage systems, *Storm drains, Storm runoff, Urban hydrology, *City planning, *Optimal development plans, *Indiana, LANDSTORM, URBDRAIN, LANDUSE, *Optimization.

A watershed in an urban area may be partitioned into subbasins, each of which is a tributary to a downstream subbasin or to a receiving water body. The planning of a storm drainage system for such a watershed according to the requirements of Section 208, PL 92-500, can be efficiently accomplished by coordination of the interactions among the subbasins. A model for these interactions is presented and implemented in the urban storm drainage planning model URBDRAIN. The planning variables in the model are maximum convey

; capacities of the drainage network, placement
d size of detention storage facilities, and size of a
ntral treatment facility. A two-level optimization
ution procedure is shown which provides mini-
l-cost values for the planning variables. An ex-
ple application is shown for a medium size
mmunity in Indiana.
79-03107

**ANNING STORM-DRAINAGE SYSTEMS
R URBAN GROWTH,**
rdue Univ., Lafayette, IN. School of Civil Engi-
ering.
Dendrou , J. W. Delleur, and J. J. Talavage.
urnal of the Water Resources Planning and Man-
ement Division, Proceedings of the American
ciety of Civil Engineers. Vol 104, No. WRI,
v. 1978, 16 p, 10 fig, 19 ref. OWRT B-083-IND

escriptors: *Land use, *Runoff, *Storm runoff,
rban drainage, Floods, *Planning, *Indiana,
nduse, Storm, Landstorm, Growth projections.

package is developed that integrated and inter-
es an urban growth simulation model and an
an hydrology model, so as to explicitly evaluate
effectiveness of nonstructural measures, e.g.,
ning as far as the drainage system is concerned.
ternate growth scenarios can thus be directly
ated to the corresponding storm-drainage sys-
ns of specified standards of performance.
nong the remaining 'Best Management Practice'
ntrol options, the on-site storage, treatment and
ntrolled overflow are retained as accurately rep-
senting the facets of urban stormwater manage-
nt relevant at the planning stage. This is
hieved by including these controls in a simula-
n of the hydrologic behavior of each local drain-
e basin of an urban agglomeration separately. An
plication is given for a medium size community
Indiana.
79-03108

**STEMATIC PLANNING OF URBAN
ORM-DRAINAGE UTILITIES,**
rdue Univ., Lafayette, IN. School of Civil Engi-
ering.
A. Dendrou, J. W. Delleur, and J. J. Talavage.
: International Symposium on Urban Storm
ater Management. University of Kentucky, Lex-
gton, Kentucky. July 24-27, 1978. p. 229-234, 5
, 1 tab, 7 ref. OWRT B-083-IND (7).

escriptors: *Urban drainage, *Urban runoff,
and use, Storm water, Storm runoff, *Communi-
development, Drainage systems, Urban hydrol-
y, Planning, *City planning, *Computer pro-
ams, Model studies, Urban growth, Landuse,
orm.

computer program package is developed that
tegrates and interfaces an urban growth simula-
n model, LANDUSE, and an urban hydrology
odel, a modified version of STORM. Alternate
owth scenarios can thus be directly related to
e corresponding storm-drainage systems. If these
stems are designed to achieve specified standards
performance, then a useful comparison among
veral possible urban growth patterns can be per-
rmed. While an urban area encompasses several
tural watersheds, the hydrologic models simu-
te one watershed at a time. The different water-
eds that partition an urban agglomeration create
tree-like or dendriform configuration. The plan-
ng of a global storm drainage system for such a
nglomerate of basin can be efficiently accom-
ished by a coordination of the interactions
nong the different basins. A model for these
teractions is developed. The planning variables
e the drainage network capacity, the placement
d size of the storage facilities, and the size of a
ntral treatment facility. An example of applica-
n is shown for a medium size community in
diana.
79-03109

**SERS MANUAL FOR LPTOR - A FORTRAN
LINEAR PROGRAMMING ROUTINE,**
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W79-03123

A NEW APPROACH TO URBAN WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.
D. R. Maidment, and V. T. Chow.
In: The Environment of Human Settlements: Human Well-being in Cities, Proceedings of the Conference held in Brussels, Belgium, April 1976, p 249-259, 1976. 3 fig, 26 ref, Pergamon Press, England. OWRT B-084-ILL(3), 14-31-0001-4080.

Descriptors: *Optimization, Planning, Operations research, Systems analysis, Model studies, *Urban water resources systems, Urban population.

The modern concept of urban water resources planning is to formulate the problems as hydroeconomic systems and then to optimize the systems using operatons research techniques. A new approach to this optimization based on state variables is developed for urban water resources systems. The application of this approach to urban hydrologic problems is outlined and illustrated with an example. The incorporation of state variable models of the systems into procedures for determining the design and operational policies for urban water facilities is discussed.
W79-03124

RESIDUALS MANAGEMENT PRIORITIES FOR THE MONONGAHELA RIVER BASIN.
Resource Planning Associates, Inc., Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03146

SPILL RISK ANALYSIS PROGRAM: METHODOLOGY DEVELOPMENT AND DEMONSTRATION. FINAL REPORT,
ORI, INc., Silver Spring, MD.
For primary bibliographic entry see Field 5G.
W79-03148

ENVIRONMENTAL RESOURCES MANAGEMENT STUDIES OF THE KISSIMMEE RIVER BADSIN,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W79-03150

DATA-INTENSIVE SPATIAL SAMPLING AND MULTIPLE HIERARCHICAL CLUSTERING: METHODOLOGICAL APPROACHES TOWARD COST/TIME EFFICIENCY IN NATURAL RESOURCE ASSESSMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
A. F. Frondorf, M. M. McCarthy, and W. O. Rasmussen.
Landscape Planning, Vol. 5, No. 1, p 1-25, 1978. 11 fig, 17 ref. National Park Service Grant PX 810060108.

Descriptors: *Sampling, *Spatial distribution, *Methodology, *Rhyolite Canyon Watershed(AZ), *Cluster analysis, *Resource management, Analytical techniques, Natural resources, Arizona, Chiricahua National Monument(AZ), National Monuments, Computer programs, Forecasting, Decision making, Planning, Computer models, Model studies, Baseline studies, Cost-effectiveness, Economic efficiency, Dendrograms.

Data-intensive sampling and multiple simultaneous hierarchical cluster analyses were combined into a total methodology to develop a computerized natural resources information system for the Rhyolite Canyon watershed, later to be extended to the entire Chiricahua National Monument, Arizona. The system predicts consequences of management decisions on the resource base. The method relies on existing computer software capabilities, and represents a significant breakthrough in cost/time efficiency in the production of an operational natural resource data base. Although total costs, manhours, and computer time are reduced to a minimum, the system produces two- and three-dimensional computer graphic displays representing several hundred individual pieces of natural resource information. The clustering program CLUSTAN was chosen for the cluster analyses. The polythetic agglomerative strategy of clustering joins individuals or groups together (agglomerative) on the basis of their similarity among several variables (polythetic). Results are displayed in the form of dendrograms, with individuals arrayed along the horizontal axis and similarity decreases on the vertical axis. Dendrogram interpretation showed elevation, slope, and vegetation type and density to be 'indicator' data types, with all remaining data types linked to these four, the only ones entered and stored. Costs and time are economized, while sacraficing neither accuracy nor specificity. (Lynch-Wisconsin)
W79-03188

USER'S MANUAL FOR QPTOR - A FORTRAN IV QUADRATIC PROGRAMMING ROUTINE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W79-03271

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,
Instituto Venezolano de Investigaciones, Cientificas, Caracas. Lab. de Ingenieria Ambiental.
For primary bibliographic entry see Field 5G.
W79-03425

6B. Evaluation Process

SOME LOCAL ECONOMIC IMPACTS OF THE MISSOURI RIVER RESERVOIRS WITHIN SOUTH DAKOTA (EFFECTS OF CONSTRUCTION, RECREATION, AND IRRIGATION AS REVEALED BY ANALYSIS OF SECONDARY DATA),
South Dakota State Univ., Brookings. Dept. of Economics.
R. L. Vertrees.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 752, Price codes: A99 in paper copy, A01 in microfiche. Water Resources Institute, South Pacific University. Completion report, December 1978. 624 p, 22 fig, 76 tab, 15 append. OWRT B-025-SDAK(1). 14-01-0001-3648.

Descriptors: *Irrigation, *Recreation, *Economic impact, *River basin development, Social impact, Employment, Population, Income, *South Dakota, *Missouri River, Reservoirs, Dam construction.

Information is provided about local economic impacts that resulted from construction of the four mainstem dams along the Missouri River within South Dakota and that have been brought about within the state by recreational and irrigational uses of reservoirs impounded by these dams. Findings are based upon analyses of data obtained from published sources and agency records. Economic impacts were estimated upon selected counties adjacent to the reservoirs, separate reservoir regions, and upon the entire reservoir region. The type of impacts studied were: effect upon population levels, total personal income, per capita income, personal income received by employees within specific industries or sectors and the number of employees and establishments within these industries or sectors. (Wiersms-South Dakota)
W79-03001

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASES II AND III,
Pennsylvania State Univ., University Park. Coll. of

Health, Physical Education, and Recreation.
B. van der Smissen, and M. L. Christiansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 771, Price codes: A11 in paper copy, A01 in microfiche. Institute for Research on Land and Water Resources. Pennsylvania State University, Research Publication 101, October 1978. 246 p, 4 fig, 4 tab, 668 ref, 2 append. OWRT A-033-PA(2). 14-31-0001-5038.

Descriptors: *Standards, *Recreation, *Pennsylvania, *Watersheds(Basins), Land use, Surface waters, Vegetation, Meteorological data, Wildlife, *Outdoor recreation planning, *Recreation activities, Kinetic recreation, Harvest recreation, Beach swimming, Family camping.

In Phase II a typology of activities was developed which included three major divisions: kinetic recreation, situation-oriented recreation, and 'harvest' recreation. Each of the three divisions has been subdivided into three categories with primary orientation of land, water, or air, but with the situation-oriented division also having an educational enhancement category. Also, as part of the typology phase of the study, characteristics of users and classification of activities by characteristics and by nature of user experiences have been identified and synthesized. A conceptual model for planning purposes based on the development of resource requirements determinants for selected activities was structured in Phase III. A resource descriptor classification system was established. It was structured around commonly accepted significant conditions and supplemented with additional natural conditions considered important. The master list of descriptors included 77 descriptors divided into five categories: land, surface water, vegetation, meteorological, and wildlife descriptors. The model was tested for beach swimming at four Pennsylvania State Parks and for family camping at two. An activity analysis of the two activities as well as the details on the indicators of land-use capabilities are presented. (See also W77-05484) (Sink-Penn State)
W79-03004

EVALUATION OF ALTERNATIVE STORMWATER MANAGEMENT POLICIES,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, and G. E. Kamedulski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 736, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, Technical Report No 50, October 1978. 12 p, 6 tab. OWRT A-047-MD(1). 14-34-0001-8022.

Descriptors: *Stormwater management, Detention storage, Urban hydrology, *Evaluation, Water quality, Sediment control, *Alternative planning, *Water policy, Storm runoff.

Stormwater management is recognized as a requisite to controlling storm runoff from developing areas. To best meet societal needs, numerous policies have been adopted to meet the intent of stormwater management. Unfortunately, many policies are deficient in their failure both to lead to designs that meet the intent of stormwater management and to provide the proper guidelines for translating policy into a design that provides the maximum benefit to society. Specific deficiencies of many policies include: (1) the use of a single frequency; (2) neglect of storm duration; (3) inadequate consideration of maintenance; (4) insensitivity to the importance of soil characteristics; (5) lack of recognition of differences between water quantity and quality control; and (6) lack of consideration of downstream effects of detention storage. The effects of these policy deficiencies were evaluated.
W79-03039

OPTIMIZATION MODEL FOR THE EVALUATION OF FLOOD-CONTROL BENEFITS OF MULTIPURPOSE MULTIRESERVOIR SYSTEMS,
Texas Univ. at Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W79-03044

SOME THEORETICAL AND MEASUREMENT ISSUES IN ECONOMIC ASSESSMENT OF INTERBASIN WATER TRANSFERS,
California Univ., Berkeley.
A. C. Fisher.
Water Supply and Management, Vol. 2, No. 2, p 137-145, 1978. 10 ref.

Descriptors: *Economics, *Assessment, *Interbasin transfer, *Water resources, *Environmental effects, *Cost-benefit analysis, Regional analysis, Systems analysis, Equations, Impact analysis, Environmental costs, Uncertainty, Irreversibility, Sequential model, Investment.

Tremendous increases in the size and cost of recently proposed interbasin water transfers (IWT's) ncessitate careful consideration of their economics. Offered are critical remarks concerning concepts and measurement techniques for assessing the costs and benefits of IWT's. The remarks fall into three categories: (1) methods of measuring conventional economic costs and benefits; (2) the introduction of environmental effects; and (3) special problems posed by the very long-lasting and uncertain consequences--including those to the environment--of the IWT projects. The current 'best practice technology' for assessing the impact of an IWT on a region's economy is input-output analysis. This method does not represent an advance over simpler alternative methods of regional impact analysis. Proposed is the use of an econometric modeling technique that can account--as input-output analysis does not--for both changes in the structure of the impacted region's economy and the time periods required for these changes to work themselves out. However, an IWT is virtually certain to have an impact--quite possibly adverse--on the environment that is not reflected even in the most sophsticated econometric analysis. Discussed is how the impact can, in principle, be incorporated into the benefit-cost analysis. Moreover, very long time spans and problems of uncertainty are not tractable to conventional benefit-cost analysis. The interaction between uncertainty and irreversibility (of a project's effects) have some rather sharp qualitative implications for policy. It is difficult to make any quantitative assessment of the 'option value' of deferring. (Bell-Cornell)
W79-03080

ANALYZING HYDROLOGIC UNCERTAINTY AND ITS IMPACT UPON DECISION MAKING IN WATER RESOURCES,
Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-03081

DEMAND, SUPPLY, AND ECONOMIC EFFICIENCY,
Maryland Univ., College Park.
For primary bibliographic entry see Field 6D.
W79-03084

PLANNING IN SMALL- AND MEDIUM-SIZE ILLINOIS MUNICIPAL WATER SYSTEMS,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 3D.
W79-03097

ALTERNATIVES FOR MANAGING A FINITE GROUNDWATER SUPPLY IN AN ARID REGION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W79-03131

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
G. Aron, and S. P. Coelen.
Available from the National Technical Informati Service, Springfield, VA 22161 as AD-A045 1 Submitted to U.S. Engineering Institute for Wa Resources, Fort Belvoir, VA, IWR Contr Report 77-4, July 1977. 198 p., 32 fig., 23 t DACW31-75-C-0018.

Descriptors: *Water supply, *Marginal co *Average costs, *Water supply developme *Inter-basin transfers, *Regional developme *Regional water supply, *Regionalization, Wat Reservoir yield, Water resources, Reservoir st age, Economies of scale, High flow skimmi Reservoir enlargement, Time series analysis.

This report seeks to evaluate the belief that regi alization of water supply in the U.S. is a key fac in solving problems of water supply and wa treatment. A brief history of regionalization tempts in the U.S. and causes for failure are c cussed. Most regionalization plans have failed b because of political and institutional constrai and because problems of efficiency and equ were not resolved. The feasibility of regionali tion of water supply and waste disposal system then discussed. The report examines economies scale with respect to storage reservoirs, treatm facilities, well construction, transmission pipel construction, pumping operations, and others. C curves are presented for all operations, but o storage reservoirs and treatment facilities offe any kind of economy of scale. The Centre Reg around State College, PA was chosen as a c study site for the micro-scale study phase, an comparison of costs of local versus regionali water supply systems was conducted. Methodol ical tools were developed for estimating firm yie from reservoirs and expected shortages given lo term average streamflow and specific wa demand for local and regional water systems. critical look is taken at interbasin water trans and its problems. It is concluded that there is li economy of scale when water supplies are dev oped from groundwater sources. Also, any gi water supply (sewage) project can produce dis butional consequences which may cause reject of regional plans. (Coan-NC)
W79-03140

SUSQUEHANNA RIVER BASIN STUDY: SU MARY.
Susquehanna River Basin Study Coordinati Committee.
Available from the National Technical Informati Service, Springfield, VA 22161 as AD-A043 8 Price codes: A08 in paper copy, A01 in microfic June 1970. 168 p, 27 tab, 56 fig. See also Supp ments A and B.

Descriptors: *Comprehensive planning, *Water sources development, *River basin developme *Susquehanna River, Chesapeake Bay, Land sources, Land management, Watershed mana ment, Recreation, Water supply, Water quali Flood control, Short-term planning, Long-te planning, Administration, Coordination, Legi tion, Political aspects, Governments, Economic ficiency, Investment, Economic justification, E nomic impacts, Water policy, Needs assessme Implementation.

This volume is a summary of the comprehens plan for the development of water and related l resources of the Susquehanna River Basin. T objectives of the study were to evaluate the wa resources potential of the basin, to determine water resource requirements of an increasing po lation, to analyze alternative solutions, to rec mend management programs and to preserve high natural values of the basin for the use present and future generations. In the first chapt the basin's needs are outlined: water quality, rec ation, water supply, flood control, land mana ment, electric power, streambank stabilization erosion control. The plan for the Susquehanna reviewed, implementation suggestions are prese ed and policy recommendations made. The sec chapter deals with the basin's environment— physical and human landscapes and man's imp on the basin's water and land resources. Exac how the plan will affect the four major needs

ter quality, recreation, water supply and flood ntrol is then assessed. The planning background leveloped, plan formulation reviewed and public olvement addressed. Both an early action plan l a framework plan were developed; the former ks to the conservation and development of the in's resources with a 10-year horizon, and the ter looks at long-range requirements and opportities, reaching to the year 2020. Adequacy and ects of the plan as they affect the four major eds of the basin are then addressed. A final apter looks at putting framework plan, investnt analysis and priorities and policy and legisla- e recommendations. (See also W79-03143 and 79-03144) (Zayac-NC)
79-03142

SQUEHANNA RIVER BASIN STUDY: SUPEMENT A--PLAN FORMULATION.
squehanna River Basin Study Coordinating ommittee.
vailable from the National Technical Information rvice, Springfield, VA 22161 as AD-A043 888, ice codes: A12 in paper copy, A01 in microfiche. ne 1970. 265 p, 28 fig, 22 tab. See also Summary d Supplement B.

escriptors: *Water resources development, iver basin development, *Comprehensive plan- ng, *Watershed management, *Susquehanna ver, Land resources, Land management, Chesa- ake Bay, Administration, Coordination, Multi- e-purpose projects, Economic efficiency, Bene- s, Costs, Investment, Economic impact, Eco- mic justification, Regional analysis, Alternative anning, Long-term planning, Short-term plan- ng, Institutions, Environmental effects, Govern- ents, Recreation, Public participation, Pollution atement, Flood damage reduction, Electric wer, Navigation, Streambank stabilization.

ne objective of this Supplement A to the Main eport is the formulation of a comprehensive plan r the development of water and related land sources of the Susquehanna River Basin. Existing d presently programmed development is inven- ried for a number of items: municipal, industrial d agricultural water supply; general outdoor rec- ation; fish and wildlife; pollution abatement; od damage reduction; streambank stabilization; ectric power; navigation; and the Chesapeake y. An investigation is conducted as to whether a ttern of problems can be determined; the feasibil- of systematic analysis is explored. The plan rmulation work shop approach is outlined, objec- ves are defined and criteria for formulation devel- ed. A formulation procedure is set up, alterna- ve solutions generated, and the alternatives are reened. Base plan measures are selected. The ternatives are studied by objectives; these include conomic efficiency, regional development, envi- nmental quality and multiple-objective formula- on. Critical choices among alternatives are identi- ed as these alternatives apply to four different b-basins--the Upper Susquehanna Basin in New ork, the Chemung River Basin, Condoguinet reek and Codorus Creek--and the Susquehanna iver Basin and Chesapeake Bay. The public influ- nce in the planning process is assessed; local plan- ng meetings and public forums are described. ee also W79-03142) (Zayac-NC)
79-03143

USQUEHANNA RIVER BASIN STUDY: SUPLEMENT B--PROGRAM SUMMARY.
usquehanna River Basin Study Coordinating ommittee.
vailable from the National Technical Information ervice, Springfield, VA 22161 as AD-A043 889, rice codes: A09 in paper copy, A01 in microfiche. une 1970. 194 p, 48 tab, 47 fig. See also Summary nd Supplement A.

Descriptors: *Programs, *Land management, Watershed management, *Water resources devel- pment, *River basin development, *Susquehanna iver, Chesapeake Bay, Project planning, Long- erm planning, Short-term planning, Comprehen- ve planning, Structures, Land development, Water quality management, Land resources, Non-structural alternatives, Land use, Regulation, Federal government, Water quality, Multiple-purpose reservoirs, Recreation, Fisheries, Water supply, Flood control, Structural measures.

This Supplement B is intended to reinforce the Summary Report by providing more detailed information on the Summary's recommendation. The study was undertaken to provide a comprehensive plan for the development of water and related land resources of the Susquehanna River Basin. In this volume, particular attention is given to the Plan in each of eight hydrologic sub-basins identified in the study, the intent being to make information more accessible at the local and regional level. Each sub-basin is discussed in detail. Its water requirements are inventoried. Short-term recommendations are presented in the form of an Early Action Plan; long-term recommendations are presented in subsequent discussion of rhe Framework Plan. Alternatives to structural measures are then recommended. Following the description of the Plan by sub-basin, a final chapter suggests means to implement it, including general recommendations for the relative share of the costs between Federal and non-Federal interests. Structural and management measures are discussed. Under structural measures, water quality management, major multiple purpose dams and reservoirs, reservoirs for recreation and fishing habitat, groundwater and pipelines for municipal and industrial water supply, local flood protection projects, and upstream watershed projects are reviewed. Under management measures, land and stream management are assessed. (See also W79-03142) (Zayac-NC)
W79-03144

ENVIRONMENTAL POLLUTION CONTROL: TWO VIEWS FROM THE GENERAL POPULATION,
Kansas State Univ., Manhattan. Dept. of Political Science.
For primary bibliographic entry see Field 5G.
W79-03154

THE PUBLIC DECIDES ABOUT WEATHER MODIFICATION,
Colorado Univ., Boulder. Human Ecology Research Services.
For primary bibliographic entry see Field 3B.
W79-03155

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY. VOLUME I: MAIN REPORT.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 824, Price codes: A13 in paper copy, A01 in microfiche. January 1964. 220 p, 62 tab, 26 fig, 8 plates, attachment.

Descriptors: *Water resources, *Water resources development, *Flood control, *Flow augmentation, *Planning, *Meramec River(MO), Missouri, Water supply development, Multiple-purpose reservoirs, Watershed management, Water quality, Recreation, Fish management, Wildlife management, Economics, Cost-benefit analysis, Coordination, Structural alternatives, Economic justification, River basin development, Plan implementation.

The study's objective is to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. The flow of the Meramec River is extremely variable--low flows in the summer are insufficient to provide adequate waste dilution, while flooding at other times is quite destructive. The plan presented for the Basin consists of seven main stem reservoirs, 12 tributary stream reservoirs, 12 headwater reservoirs, 26 angler-use sites and nine local protection projects. The plan will provide: flood control equal to standard project flood protection in the lower basin with upper basin protection against floods of 10- to 15-year frequencies; water quality control and supplemental water supply requirements to the year 2020; practicable recreation and fish and wildlife development; and economic improvement in the upper basin. Hydroelectric possibilities are reviewed and possibilities are retained for further consideration. Recommendations for implementation and coordination are provided; costs are estimated. Detailed considerations of the suggested structural projects are presented. The general outline of the report follows: basin description; present economic development; existing projects and improvements; projected economic growth and related water resource problems; plan formulation; detailed descriptions of the proposed improvements; estimates of first costs and annual charges; estimates of benefits; economic justification; apportionment of costs; coordination with other agencies; local cooperation; and plan implementation. (See W79-03165 thru W79-03172) (Zayac-NC)
W79-03164

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME II, APPENDIX A: THE ECONOMY AND CHARACTER OF THE MERAMEC,
Washington Univ., St. Louis, MO.
E. L. Ullman, R. R. Boyce, D. J. Volk, R. C. Smith, and F. Miller.
December 1961, 266 p, 6 chapters.

Descriptors: *Water resources development, *Industries, *Mining, *Recreation, *Land use, *Agriculture, *Population, Missouri, Economic impact, Industrial production, Industrial plants, Mining engineering, Geology, Mineral industry, Environmental effects, Aesthetics, Recreation demand, Recreation facilities, Land management, Land development, Soil conservation, Farms, Crops, Employment, Income, Forestry, *Meramec River(MO), Urban-industrial distribution, Economic development.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. Appendix A deals with the economy and character of the study area. No summary is provided as the volume is comprised of six distinct chapters. The first chapter on location, population and development begins with a discussion of terrain, climate and forest cover. Employment and income are reviewed, as is transportation and its relation to the St. Louis metropolitan area. Recent trends in population are outlined as baseline data for projections and predictions. Economic development and education are discussed. Chapter 2 has two parts: physical land conditions and agricultural conditions and trends. In Part 1, a review of land characteristics and capabilities is followed by a review of land use and conservation. Part 2 outlines characteristics of land and farms, trends in acreage of principal crops, crop yields and farms income. Chapter 3 on forestry inventories the Meramec Basin forest resource, reviews factors that affect timber growing, lists timber products and industries and projects the forest future. Chapter 4 is concerned with recreation and scenic resources, summarizing the historical and present recreation in the Basin and projecting future recreational opportunities. Chapter 5 is a report on mining. In Part 1, rock and mineral commodities are outlined, including geology and metallic and non-metallic commodities; Part 2 discusses future possibilities: new mineral developments and prospects for nearby steel production. Chapter 6 deals with towns, industry and trade. Here, the primary areas of emphasis are urban-industrial distribution patterns, industrial competition and the dilemma of industrial promotion. (See also W79-03164) (Zayac-NC)
W79-03165

MERAMEC RIVER, MISSOURI. COMPREHENSIVE BASIN STUDY, VOLUME III. APPENDIX B: WATER NEEDS AND PROBLEMS,
Washington Univ., St. Louis, MO.
For primary bibliographic entry see Field 5G.
W79-03166

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME IV. APPENDIX C: HYDROLOGY: APPENDIX D: GEOLOGY, SOILS AND MATERIALS.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 827, Price codes: A14 in paper copy, A01 in microfiche. January 1964. 308 p.

Descriptors: Hydrology, *Soils, *Geology, *Construction materials, *Meramec River(MO), Missouri, Hydroloic data, Hydrologic aspects, Hydrologic cycle, Hydrologic systems, Geohydrological units, Synthetic hydrology, Evaporation, Groundwater, Precipitation(Atmospheric), Rainfall, Running waters, Snowfall, Soil water, Runoff, Geologic units, Geologic formations, Engineering geology, Geomorphology, Glaciology, Mineralogy, Physiographic provinces, Materials engineering, Soil types, Soil engineering, Soil groups, Soil properties.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet short- and long-term needs. This volume is comprised of two appendices. App. C contains hydrologic, hydraulic and water resource data important to the basin-wide plan for the Meramec River. A detailed description of precipitation patterns follows a quick overview of the basin's general climatological features. Annual, seasonal, abnormal, and subnormal precipitation, annual snowfall and rainfall intensity data, are presented. The magnitude and frequency of floods are developed, stream flow data are presented, and yields are estimated. Water supply demands for various uses are noted, and evaluations made as to how these demands can be met by projects considered in the study. Flood control benefit analysis uses hydrologic data developed in this appendix. The purpose of App. D is to present all geologic data that might influence engineering and economic feasibilities of the study's proposed projects. Physiography is reviewed in terms of topography, drainage and geomorphology. General geology of the basin is discussed through an investigation of the geological aspects and mineral resources of the sub-basins, stratigraphic succession, surface rock and groundwater characteristics. The geology of each proposed main stream, tributary and headwater reservoir is outlined. Soil data and the availability of construction materials reviews close out the appendix. (See also W79-03164) (Zayac-NC)
W79-03167

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME V. APPENDIX E: PROJECT DESIGNS AND COST ESTIMATES; APPENDIX F: HYDROPOWER.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 696, Price codes: A14 in paper copy, A01 in microfiche. January 1964, 316 p.

Descriptors: *Project feasibility, *Project planning, *Water resources development, *Hydroelectric plants, Missouri, Design, Project purposes, Project life, Sites, Multiple-purpose reservoirs, Economics, Cost allocation, Relocation, Electrical design, Bores, Hydroelectric power, Cost analysis, Planning, Coordination, Pumped storage, Foundation investigations, Economics, *Meramec River(MO), Land requirements, Conventional power, Discharge data, Head data.

The Meramec River comprehensive basin study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. Volume V is comprised of two appendices. Appendic E contains the design and cost estimates of the physical features of each proposed element of the recommended comprehensive plan for development of water resources of the Meramec River Basin. A description of each of the seven main stream reservoirs, of the 12 tributary reservoirs, and of the 12 headwater reservoirs is provided. Angler-use sites and local protection projects are described. In each of these descriptions, location, design detail, electrical features, borings, relocations and alterations, land requirements and cost estimates are discussed. Appendix F studies hydropower, its design details, cost estimates, economics and plans. Coordination with the Federal Power Commission and the Southwestern Power Administration is outlined. Conventional power, pumped storage and conventional plant alternatives are weighed. Three facilities are evaluated: Meramec Park, Pine Ford, and Salem. For each, head and discharge data, design details and foundation investigations are presented. Cost estimates follow, and an economic analysis ends the report. (See also W79-03164) (Zayac-NC)
W79-03168

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VI. APPENDICES G THROUGH L.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 697, Price codes: A13 in paper copy, A01 in microfiche. January 1964, 296 p.

Descriptors: *Planning, *Water resources development, *Land use, *Reservoirs, *Forest management, *Mineral industry, *Groundwater resources, *Water resources, Missouri, Land resources, Land appraisals, Land classification, Land management, Hydrology, Hydraulics, Hydraulic engineering, Forest soils, Forestry, Watershed management, Mining, Groundwater availability, Groundwater basins, Groundwater movement, Groundwater potential, Groundwater recharge, Water supply, Water quality, *Meramec River(MO), *Mineral resources.

This study was undertaken to devise a program for development of the Meramec Basin's water and related land resources to meet short- and long-term needs. Vol. VI contains 6 appendices. App. G has two parts: Part 1, Physical Land Condition, and Part 2, Design and Cost Esimates for Headwater Reservoirs. Part 1 assesses basin geology and soils, then presents a resource area map. A land use capability classification system is presented, followed by a more extended discussion of land use and conservation measures. Part 2 reviews the geology of the headwater reservoir sites, then outlines hydrologic, hydraulic and engineering investigations of the sites. App. H is a Plan of Participation by the USDA. It outlines departmental planning objectives, the principal features of the USDA study and the scope and responsibilities of USDA agencies. App. I is a Report on Forest Resources Potential. Present and future resources are assessed, as are present and future possibilities of markets for these forestry resources. Impacts and contributions of the resource are reviewed by looking at demands and benefits accruing to the local economy in terms of employment and increased income. App. J--Mineral Resources and Mineral Industry--analyzes the mineral resources of the basin. A section on refractory clays in the basin looks at clay typology and the clay industry. Iron and lead deposits and stone and gravel are reviewed. App. K--Groundwater Use and Production Capabilities--evaulates groundwater use and potential. App. L--a Water Resources Study-- is a preliminary evaluation of the need for and value of storage for municipal and industrial water supply and water quality control in the basin. Projects are described, present water use is outlined, and future water requirements are reviewed. (See also W79-03164)(Zayac-NC)
W79-03169

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME VII. APPENDICES M THROUGH S.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 698, Price codes: A13 in paper copy, A01 in microfiche. January 1964. 289 p.

Descriptors: *Water resources development, *Multiple-purpose projects, *Recreation, *Fish management, *Wildlife management, *Caves, *Flood control, *Benefits, *Meramec River(MO), Missouri, Recreation demand, Recreation facilities, Reservoir operation, Impoundment, Surface waters, Reservoir storage, Water sources, Water supply, Forest management, Fish populations, Fish conservation, Wildlife conservation, Wildlife, Economics, Flood damage, Flood plains, Flood protection, Floods, Cost-benefits analysis, Estimated benefits, Public opinion, Citizen participation.

This study was undertaken to devise a program for development of the Meramec Basin's water and related land resources to meet short-and long-term needs. This volume contains 7 appendices related to components of the proposed plan. App. M--Recreation Needs Related to Reservoirs--evaluates recreational needs, reviews present status of water-based recreational opportunities and shows that water as a recreation resource is available only in streams or rivers. An attempt is made to analyze recreation demand once reservoirs are in place. App. N--Multiple Use Survey-considers the impacts of the proposed basin project on the Clark National Forest and non-Federal lands. Facilities, services, resources and uses that will be affected are described. App. O--Effect on Fish and Wildlife--reviews present status of fish and wildlife resources, and discusses the effects on these resources once the project is implemented. Benefits and costs resulting from implementation are analyzed and recommendations concerning specific project lands and waters are made. App. P--Effect on Caves--discusses the effects of the proposed reservoir system on the principal caves which are major attractions on the area. No deleterious effect will be suffered other than flooding of the lower level of one cave. App. Q studies Flood Control Economics. Present conditions of flood plain development and flood damages are outlined with and without implementation of the proposed plan. App. R--Evaluation of Benefits--explains the derivation of benefits attributable to the proposed plan. Reservoir benefits for flood control, water quality, water supply, and others are enumerated. Area reorientation benefits are studied; negative benefits are reviewed. App. S--Digest of Public Opinion--reviews public opinion solicited before, during and after the study. (See also W79-03164)(Zayac-NC)
W79-03170

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VIII. APPENDIX T: DETAILED COST ESTIMATES.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 699, Price codes: A14 in paper copy, A01 in microfiche. January 1964, 327 p, 60 tab.

Descriptors: *Multiple-purpose reservoirs, *Water resources development, *Cost analysis, Missouri, Cost allocation, Economics, Construction costs, Cost-benefit analysis, Cost comparisons, Unit costs, Cost repayment, Benefits, Costs, Low-flow augmentation, Water quality, Water supply, Recreation, Flood control, Conservation. *Meramec River(MO), Economic development.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. Appendix T first reviews in a general fashion the bases of design and ways of estimating costs. Basis of design for reservoirs, local protection projects and angler-use sites are summarized from detailed design considerations presented in Appendix E. These design requirements then serve as a basis for very precise cost estimates. Plans for individual reservoirs were considered on a multiple-purpose basis; attention was given to low-flow augmentation, water quality control, water supply, recreation, economic development, conservation and flood control. Costs were allocated on the basis of costs developed in this appendix, and the benefits contained in Appendix R were used to develop benefit-cost ratios for each purpose in each reservoir. The cost estimates for the various elements contained in the comprehensive basin plan are divided into three separate parts: cost estimates for

1 multiple-purpose reservoirs; cost estimates for 9 ocal protection projects; and cost estimates for 26 ngler-use sites. Unit costs are based on July 1963 rice levels and upon experience of comparable vork types in the same area. Allowances are included for contingencies and maintenance during onstruction. (See also W79-03164) (Zayac-NC)
W79-03171

COMMENTS ON ADVANCE COPY OF SUMMARY REPORT ON MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY.
Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 828, Price codes: A05 in paper copy, A01 in microfiche. 23 April, 1965. 79 p.

Descriptors: *Water resources development, *Planning, *River basin development, *Meramec River(MO), *Reviews, Missouri, Coordination, Water supply, Water quality, Multiple purpose projects, Reservoirs, Participation, River basins.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. This volume is a compendium of comments on the draft copy of this study. Contributors include the U.S. Army Corps of Engineers, St. Louis District; Dept. of Health, Education and Welfare, Kansas City Regional Office; and the U.S. Army Corps of Engineers, Board of Engineers for Rivers and Harbors, Washington Office. The memoranda question specific data and wording in the draft report and offer supplementary data to the original study. (See also W79-03164) (Zayac-NC)
W79-03172

DATA-INTENSIVE SPATIAL SAMPLING AND MULTIPLE HIERARCHICAL CLUSTERING: METHODOLOGICAL APPROACHES TOWARD COST/TIME EFFICIENCY IN NATURAL RESOURCE ASSESSMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6A.
W79-03188

COMMERCIAL SAILING VESSELS - AN ECONOMIC ASSESSMENT,
H. M. Close.
The Naval Architect, No. 5, p 166-168, 1978. 2 tab, 11 ref.

Descriptors: *Ships, *Sailing ships, *Costs, *Energy, *Oil, *Transportation, *Economic feasibility, Economics, Wind energy, Operating cost, Investment, Fuels, Capital costs, Cargo, Weight, Carrying capacity.

Commercial wind-powered sailing vessels would be an uneconomical alternative to conventional oil-powered bulk carriers. While fuel savings are considerable, 10 of the smaller (15,000 metric ton) and three of the larger (50,000 ton) sailing ships would be required to provide the 12.1 trillion ton-miles/year carrying capacity of the conventional 100,000-ton ship, bringing total costs to far more than for the oil-powered vessel (24.7, 12.6 and 8.0 million pounds, respectively). The price of oil would have to double before the 50,000-ton wind powered ship would become economically viable. Most previous comparative studies erroneously based their conclusions of deadweight tonnage, whereas the true measure of cargo capacity is the product of deadweight and the distance the ship can cover in a given period (ton-miles). Capital costs of the three ships are estimated (in million pounds) at eight (smaller sailing ship), 12 (larger sailing ship), and 15.5 (coventional carrier). Wind-powered ships average 10 knots, compared with 15 for the conventional ship. The oil-powered ship requires 130 tons of residual oil/day at sea for fuel, plus one ton/day diesel oil for its auxiliary generating plant. The wind-powered vessels have auxiliary engines which consume 10-21 tons residual oil/day. Potential alternative energy sources include nuclear fission, solar energy, wind-powered generators, and coal. (Lynch-Wisconsin)
W79-03192

EXTRACTION, PRODUCTION AND INVESTMENTS IN CAPITAL AND LEARNING, THE NATURAL RESOURCES INDUSTRIES,
Tel Aviv Univ. (Israel). Foerder Inst. for Economic Research.
G. Fishelson.
Working Paper 34-77 November 1977. 21 p, 1 tab, 3 ref, 4 append.

Descriptors: *Natural resource, *Information, *Technology, *Capital, *Investment, *Resource extraction, Industrial production, Model studies, Mathematical models, Optimization, Economics, Economic efficiency, Public benefits, Welfare(Economics), Cost-benefit analysis, Coal mines, Electricity.

Examination of optimal extraction and investment plans for an exhaustible natural resource such as coal shows that scarce resources might be saved by technological progress induced by direct societal investment in learning. This concept augments earlier studies by (1) Burt and Cummings (1970, who examined optimal behavior of extraction and investment in capital of an industry that extracts natural resources when technological progress is exogeneously determined, and by (2) Rausser (1974), who expanded this model to include learning-by-doing, thus making technological progress an endogeneous variable. The present study assigns a social benefit to the extracted resource only after it is used to produce a consumption good, implying that a learning process carried on simultaneous with production is a substitute for both investment in learning about extraction and in learning-by-doing during extraction. Direct investment in learning supplements learning-by-doing which is a joint product of the extraction activities, and since the total stock of knowledge is thus larger the capital and the exhaustible resource are utilized more efficiently in providing the final good. While Rausser's extension implies that Burt and Cummings extraction rate might be below optimal, the present study suggests that extraction rates might be lower than those by Burt and Cummings. Social benefits in this model are greater than those on the Rausser path, since learning-by-doing is still present while more knowledge is produced by direct investment. (Lynch-Wisconsin)
W79-03194

DYNAMIC THEORY OF FISHERIES ECONOMICS--II; DIFFERENTIAL GAME THEORETIC APPROACH,
Illinois Univ. at Urbana-Champaign. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W79-03196

NOMOGRAPHS FOR TEN-MINUTE UNIT HYDROGRAPHS FOR SMALL URBAN WATERSHEDS,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
W. H. Espey, Jr, D. G. Altman, and C. B. Graves, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 158, Price codes: A03 in paper copy, A01 in microfiche. ASCE Urban Water Resources Research Program Technical Memorandum No. 32. Dec 1977. 22 p, 8 fig, 3 tab, 33 ref. NSF-APR76-17064 and NSF-ENV77-15668.

Descriptors: *Unit hydrographs, *Urban runoff, *Comprehensive planning, *Project planning, *Urban drainage, *Flood protection, Feasibility studies, Hydrologic data, *Metropolitan studies, *Conjunctive planning, Denver, Colorado, Austin, Texas, Master Planning, Combined sewer overflows, Storm sewer discharges.

While characterizations of 30-minute generalized synthetic unit hydrographs have been available for some time, the 10-minute duration relations presented extend the usefulness of this basic tool for analysis of the smaller urban catchments. The synthesized equations and associated nomographs are derived from data for 41 urban watersheds in the U.S. of which 18 are in Texas. Reliability can be enhanced by validation with local field data. A validation example is included for Denver, Colorado. Being Addendum 3 of the report 'Urban Runoff Control Planning,' June, 1977 (NTIS: PB-271 548), new references for the latter are included. This technical memorandum is one of several that will contain additional, individual Addenda over the period 1977-1979. The principal intended audience is agencies and their agents involved in the preparation of areawide plans for water pollution abatement management under Section 208 of PL 92-500, for whom synthesized unit hydrographs are a potential supplementary tool. (ASCE)
W79-03272

URBAN RUNOFF CONTROL PLANNING,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.
M. B. McPherson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 522, Price codes: A09 in paper copy, A01 in microfiche. ASCE Urban Water Resources Research Program, Report NSF/RA-770184, June 1977. 118 p, 263 ref, 2 append. NSF/RANN-APR76-17064.

Descriptors: *Urban runoff, *Comprehensive planning, *Water quality control, *Flood protection, *Feasibility studies, *Urban drainage, *Project planning, Hydrologic data, Computer models, Land use, Local governments, Design storm, Cost analysis, Detention reservoirs, Water balance, Control systems, Sediment control, Water reuse, Forecasting, Monitoring, *Metropolitan studies, *Integrated management, *Gaging network design, *Conjunctive planning, *Master planning, Combined sewer overflows, Storm sewer discharges, Simulation, Urban runoff gaging, Urban rainfall-runoff-water quality relationships, Receiving waters, Stormwater treatment.

Section 208 of PL 92-500 encourages areawide planning for water pollution abatement management, including urban runoff considerations where applicable. Prepare to assist agencies and their agents that are participants in the preparation of areawide plans, from the standpoint of major urban runoff technical issues in long-range planning, emphasized is the importance of conjunctive consideration of urban runoff quantity and quality and the need to develop a factual basis that will support expected reliability of performance of proposed actions and programs. While not intended as a handbook, some important technical issues are analyzed that are often slighted or poorly handled, such as the utilization of simulation. Recognizing that the ultimate test of any plan lies in its implementation, topics are viewed from the perspective and experience of the local government level where implementation takes place. Examples of leading local government projects are included and 310 selected references are cited. (ASCE)
W79-03273

ECONOMICS OF MINED LAND RECLAMATION AND LAND-USE PLANNING IN WESTERN STATES,
Argonne National Lab., IL.
J. R. LaFevers.
In: The Reclamation of Disturbed Arid Lands, ed. by R. A. Wright. University of New Mexico Press, Albuquerque. 1978. p 69-71.

Descriptors: *Mine wastes, *Land use, *Reclamation, *Vegetation regrowth, Administration, Comprehensive planning, Adoption of practices, Legal aspects, Contours, Institutional constraints, Economic feasibility.

The cost effectiveness of mined area reclamation programs involves an integrated analysis of extraction, reclamation, and land-use planning. Reclamation efforts should not only restore but improve land values, where possible, and with the participation of the public sector planners who possess

information on future needs and development criteria. Such participation, however, has not been a practice in the past, due largely to public planners' beliefs that reclamation is unprofitable and the possibility of mandatory participation. Additionally, state laws and Federal reclamation bills have precluded effective planning through short-sighted provisions. Failing to understand that effective integration of reclamation and land use planning is dependent upon the physical, legal, social, and economic characteristics of each area, Federal and state authorities have created provisions for reclaiming mined areas to pre-mining contours and natural vegetation. A number of mine sites in the semiarid southwest, including those in Nevada, southern and northern Arizona, and North Dakota are described in an attempt to illustrate present problems and potential solutions. (Tickes-Arizona)
W79-03433

THE IMPENDING WATER FAMINE,
United Nations Educational, Scientific and Cultural Organization, Moscow (USSR). International Hydrological Programme.
V. I. Korzun, and A. A. Sokolov.
UNESCO Courier, February 1978, p 5-9. 5 fig.

Descriptors: *Surface water availability, *Hydrologic cycle, *Water shortage, Water balance, Social impact, Economic impact, Freshwater, Population, Industrial water, Water quality, Future planning(Projected), Water Resources Planning, Forecasting, Saline water, Desalination.

Although the present volume of water on Earth is 1.386 billion cubic kilometers, the amount, quality, and use of water form a critical social and economic issue that overrides most others of our time. Since most of our water is concentrated as ocean, it is usable for most purposes only after expensive desalinaton processes. The most usable water, .007 percent of the world's total water reserves, is unevenly distributed by way of rivers and lakes. Most of the water which reaches the land is reabsorbed into the atmosphere from the seas and oceans, and precipitated into lakes and rivers. Although the ocean acts as an enormous natural desalting plant, most of this precipitation of fresh water is either returned to the ocean by rivers or added to Arctic and Antarctic glaciers. The real problem, then, is not that the earth is short of water but that its replenishment of freshwater is severely limited. Population growth, development of industry and agriculture, increasing consumption, and the deterioration of quality are documented here as the major factors aggravating this already critical problem. A comprehensive argument is set forth in this analysis to demonstrate that by the year 2015, world water resources will be close to exhaustion in the populated regions of the globe. Only by scientific and worldwide planning can measures be developed and implemented at the national, regional, and global levels to prevent further pollution and dimunition of water supplies. (Tickes-Arizona)
W79-03435

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FACTORS UTILIZED IN THERMAL POWER PLANT SITING: A REVIEW THROUGH THE MID-19702,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5G.
W79-03035

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D.
W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D.
W79-03122

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME V. APPENDIX E: PROJECT DESIGNS AND COST ESTIMATES; APPENDIX F: HYDROPOWER.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03168

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VIII. APPENDIX T: DETAILED COST ESTIMATES.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03171

COST OF SOCIAL AND ENVIRONMENTAL REGULATIONS IN CONSTRUCTION,
Ohio Northern Univ., Ada.
For primary bibliographic entry see Field 5G.
W79-03191

DYNAMIC THEORY OF FISHERIES ECONOMICS--II; DIFFERENTIAL GAME THEORETIC APPROACH,
Illinois Univ. at Urbana-Champaign. Dept. of Economics.
T. Takayama.
College of Commerce and Business Administration, Faculty Working Paper 441, October 1977. 27 p, 1 fig, 11 ref, 1 append.

Descriptors: *Fisheries, *Economics, *Game theory, *Theoretical analysis, *Commercial fishing, Open-loop catch strategy, Closed-loop catch strategy, Cournot-Nash equilibrium, Discount rates, Quadratic functions, Optimization, Welfare(Economics).

Differential game theory is applied to a two-country, one species simulation as a natural extension of the dynamic optimization approach to fisheries economics. Two strategies for solving the Cournot-Nash equilibrium are discussed: (1) the closed-loop catch strategy, and (2) the open-loop catch strategy. Quadratic-benefit is used as the objective function of each county seeking maximization subject to linear population-catch dynamics. Major conclusions: (1) stable optimal catches show that each country must regulate the total catch of its fleet; (2) mesh size should be regulated; (3) the open-loop optimal catch strategy exists only when two countries' future discount rates are the same; and (4) the higher the future discount rates, the more fish will be caught now and in the near future, and the slower the convergence of this fish population to the desired level. In the closed-loop case, and increase of country no. one's future discount rate increases the initial optimal catch of country no. one, while country no. two accepts this fact and curtails its optimal catch accordingly. Of cource, if the sum of the two countries' discount rates exceeds the rate of increase of the fish population, there will be no economically meaningful solution for the closed-loop strategy game. The open-loop strategy may be too restrictive since the condition for the existence of optimal catches depends on the equality of the two discount rates. (Lynch-Wisconsin)
W79-03196

TRADE-OFFS BETWEEN EROSION CONTROL AND PRODUCTION COSTS IN U.S. AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 4D.
W79-03284

6D. Water Demand

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W79-03057

PROCEEDINGS OF A WORKSHOP ON MODELLING OF WATER DEMANDS.
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
Held January 17-21, 1977. Report CP-78-6, June 1978, J. Kindler, Ed. 156 p, 27 fig, 7 tab, 67 ref, append.

Descriptors: *Water demand, *Mathematical models, *Forecasting, Europe, *Water supply, Water utilization, Water resources, Planning, Management, Agriculture, Regional analysis, Economics, Water pollution control, Costs, Linear programming, Equations, Systems analysis.

Water can not longer be considered a free commodity. As nations undertake more and larger projects to meet increasing water demands, the physical limitations of natural water supplies are becoming apparent. Required is an increase in the degree of detail and sophistication of modeling and forecasting water demands, which entails economic, social and environmental evaluation of alternatives aided by the application of mathematical modeling techniques to generate inputs for planning, design, and operational decisions. Presented herein are the proceedings of a Workshop held by the Resources and Environment Area of IIASA in January of 1977, comprising invited papers and reviews that together provide a good overview of what is understood as 'water demand analysis' in most of the IIASA NMO countries. The Workshop was attended by 29 people from 14 countries. Topics considered include: process modeling via linear programming; regional water supply functions; economic demand for water and economic costs of pollution control; and ecological perspective on water demand modeling; and demand modeling in such countries as Germany, Czechoslovakia, the Netherlands, England and Wales; and others. (See also W79-03084 thru W79-03088) (Bell-Cornell)
W79-03083

DEMAND, SUPPLY, AND ECONOMIC EFFICIENCY,
Maryland Univ., College Park.
A. C. Fisher.
In: Proceedings of a Workshop on Modelling of Water Demands, 17-21 January 1977, Laxenburg, Austria. J. Kindler, Ed., International Institute for Applied Systems Analysis, CP-78-6, Laxenburg, Austria, June 1978, p 11-17. 1 fig, 2 ref.

Descriptors: *Water resources, *Demand, *Supply, *Economic efficiency, Management, Equations, Marginal costs, Prices, Welfare, Cost curve, Systems analysis.

This brief paper presents an exposition of the concepts of demand, supply, and economic efficiency as a framework for water demand modeling. The information is addressed to engineers and others concerned with modeling and managing water resource systems. Demand is a relationship between price and quantity purchased, and supply is a relationship between quantity produced and incremental cost. In summary, information about the demand for water is important because without it, efficiency in the development and use of a region's water resources is not possible--even with the best technical and engineering information in the world. (See also W79-03083) (Bell-cornell)
W79-03084

ECONOMIC DEMAND FOR WATER AND ECONOMIC COSTS OF POLLUTION CONTROL,
Houston Univ., TX.

primary bibliographic entry see Field 5G.
-03085

OCESS MODELLING USING LINEAR PRO-AMMING,
ston Univ., TX.
. Calloway.
Proceedings of a Workshop on Modelling of er Demands, 17-21 January 1977, Laxenburg, tria. J. Kindler, Ed., International Institute for plied Systems Analysis, CP-78-6, Laxenburg, tria, June 1978, 37-45. 4 fig, 2 tab.

criptors: *Resource allocation, Linear pro-nming, *Mathematical models, *Ammonia, ocess modeling, Scarce resources, Demand edules, Production efficiency, Economic effi-cy, Marginal values, Alternative planning, Op-zation, Equations, Systems analysis.

veloped is a mathematical model for an industri-agricultural, or other process which has specific ctural and economic properties. The model ermines the best or optimal subset of production cesses from the complete set of alternatives vided within the model, which is capable of ducing derived demand schedules for scarce ources. Linear programming possesses the nec-ry characteristics to solve the problem of opti-lly allocating limited resources among compet-activities. The model solution: (1) identifies the imal subset of process alternatives (i.e., the pro-ction configuration); (2) the optimum levels of eration for each process selected; (3) the total imal cost of achieving a desired level of produc-n; and (4) the marginal values of limited re-rces. Linear programming models are formulat-in matrix form where the columns of the matrix scribe the processes being modeled. The linear nations are solved si ultaneously for values of activity levels, but since there are usually more riables than equations, many solutions exist. To strate model development, an example ammonia pply problem is considered. (See also W79-083) (Bell-Cornell)
79-03086

STEMS ANALYSIS APPLIED TO AGRICUL-URAL WATER DEMAND,
ternational Inst. for Applied Systems Analysis, xenburg (Austria).
R. Maidment.
: Proceedings of a Workshop on Modelling of ater Demands, 17-21 January 1977, Laxenburg, ustria. J. Kindler, Ed., IIASA, Laxenburg, Aus-a, June 1978, Publication CP-78-6, p 47-56. 4 fig, ref.

escriptors: *Agricultural, *Water demand, *Sys-ms analysis, Economics, Decision making, Ef-cts, Irrigation, Water supply, Industrial water, inear programming, Mathematical models, Farm vel, Regional level, National level, Systems anal-is.

framework for a systematic approach to the nalysis of agricultural water demand is presented which the factors involved are considered on ree levels: the farm, regional, and national levels. he agricultural production system at each level is egarded as having three components: the inputs, e production process, and the outputs. The math-matical modelling of agricultural water demand is iscussed from the viewpoint of the substitution ossibilities in the production system at each level. is concluded that on a global basis at the present me, agricultural water demand, primarily for irri-ation, is the dominant component of total water ithdrawals and consumptive use. It seems most ppropriate to consider the balance between the upply and demand for agricultural water at the egional level, the demands being modelled at the arm level using linear programming and then ag-regated to find the regional level using demand chedules. Due account must be taken of the differ-nces between agricultural and industrial produc-ion processes, particularly with regard to the spa-ial aspects of agricultural production. (See also W79-03083) (Bell-Cornell)
W79-03087

REGIONAL WATER SUPPLY FUNCTIONS,
International Inst. for Applied Systems Analysis, Laxenburg, (Austria).
For primary bibliographic entry see Field 6A.
W79-03088

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
J. J. Waelti.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 792, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, October 1977. 28 p, 2 fig, 14 tab, 4 ref. OWRT A-031-MINN(4), 14-34-0001-7050.

Descriptors: Planning, *Water rates, *Pricing, *Minnesota, *Surveys, Information exchange, *Sewer water rates, *Information systems.

Results are summarized for a survey on municipal water and sewer rates in Minnesota for 1975. Those utility systems with water meters that have flat charge rate structures for water or sewer should change them to a rate structure which levies charges proportional to water use, preferably a marginal cost pricing system. Those systems using flat charges which have no individual meters should strongly consider installing them since meter installation has been shown to reduce consumption. Declining block rates should not vary the price as much as many rate structures presently do, unless costs can be shown to decline in the same ratio. Minimum demand charges and minimum charges should be dropped in favor of a service charge. (See also W79-03122)
W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
R. L. Gardner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 687, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, University of Minnesota, Bulletin No. 96, Sept. 1977. 63 p, 13 fig, 9 tab, 45 ref, append. OWRT A-031-MINN(5), 14-34-0001-7050.

Descriptors: *Water rates, Pricing, *Minnesota, *Water demand, *Municipal water, *Elasticity of demand, Water policy, Use rates, Sewers, Prices, Water utilization, Water conservation, Water consumption, *Residential water demand.

Price elasticity of demand for residential water in Minnesota is examined, along with policy implications. Common rate forms for pricing municipal water are described and analyzed. Recommendations for improving rate sutrctures in Minnesota are made in relation to theoretical and empirical considerations. (See also W79-03121) (Waelti-Minnesota)
W79-03122

LEGAL RIGHTS IN POTOMAC WATERS, PROCEEDINGS OF A CONFERENCE AT HARPER'S FERRY, WEST VIRGINIA.
Interstate Commission on the Potomac River Basin, Bethesda, MD.
For primary bibliographic entry see Field 6E.
W79-03197

INTERNATIONAL GROUNDWATER MANAGEMENT: THE CASE OF THE U.S. - MEXICAN FRONTIERS,
New Mexico Univ., Albuquerque. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-03216

PRINCIPAL USES OF FRESHWATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03338

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCE--MID-ATLANTIC REGION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03344

6E. Water Law and Institutions

ENVIRONMENTAL IMPACT STATEMENT PROJECT,
Cornell Univ., Ithaca, NY. Coll of Engineering.
For primary bibliographic entry see Field 6G.
W79-03041

FLOODPLAIN MANAGEMENT AND WETLAND PROTECTION PROCEDURES INTERIM GUIDELINES.
Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-03101

WATER RESOURCES POLICIES AND AUTHORITIES: IMPLEMENTATION OF EXECUTIVE ORDER 11988 ON FLOODPLAIN MANAGEMENT.
Corps of Engineers, Washington, DC.
Federal Register, Vol. 43, No. 101, p. 22306-22308, Wednesday, May 24, 1978.

Descriptors: *Flood plains, *Wetlands, *Federal government, *Legal aspects, Protection, Effects, Floods, Planning, Regulation, Water policy.

This proposed regulation prescribes policies to be used by the Corps of Engineers in implementing Executive Order 11988, Floodplain Management as it pertains to the planning, design and construction of civil works projects, and to the activities under the operation and maintenance and the regulatory programs of the Corps. (Stihler-Mass)
W79-03117

STATE LAWS AND INSTREAM FLOWS,
Western Natural Resources Foundation, Salt Lake City, UT.
R. L. Dewsnup, and D. W. Jensen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 574, Price codes: A04 in paper copy, A01 in microfiche. Fish and Wildlife Service, Publication No. FWS/OBS-77/27, March 1977. 76 p. WELUT No. 023-76, 14-16-0008-2120.

Descriptors: *Instream flow, Minimum flow, *Legal aspects, *Water law, Fish, Wildlife, *Western United States, Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Utah, Arizona, New Mexico, Colorado, North Dakota, South Dakota.

Relevant water laws concerning instream flow reservations for fish and wildlife are examined for the States of Washington, Oregon, California, Idaho, Nevada, Montana, Wyoming, Colorado, Arizona, New Mexico, North Dakota, Utah, and South Dakota. The report presents an overview of Western United States' water law, identifies strategies available for reserving flows under existing laws, and presents in a matrix form the legal basis for each strategy on a state-by-state basis.
W79-03120

A 'NEW WEST' RECLAMATION TRAGEDY, THE TWIN FALLS-OAKLEY PROJECT IN IDAHO, 1908-1931,
Boise State Univ., ID.
For primary bibliographic entry see Field 3F.
W79-03132

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W79-03140

SUSQUEHANNA RIVER BASIN STUDY: SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03142

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT A--PLAN FORMULATION.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03143

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT B--PROGRAM SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03144

THE IMPACT OF ENVIRONMENTAL LEGISLATION ON ECONOMIC DEVELOPMENT IN APPALACHIAN NEW YORK.
New York State Dept. of Environmental Conservation, Albany. Office of Program Development and Planning.
For primary bibliographic entry see Field 6G.
W79-03145

WATER AND SEWER FUNDING PROGRAMS AT FMHA, EDA, AND HUD: A SURVEY OF ENVIRONMENTAL IMPLICATIONS,
National Wildlife Federation, Washington, DC. Resources Defense Div.
For primary bibliographic entry see Field 5G.
W79-03147

NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION--1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES.
New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 5G.
W79-03151

FLOODPLAIN MANAGEMENT AND WETLANDS PROTECTION.
Small Business Administration, Washington, DC.
Federal Register, Vol. 43, No. 101, p 22298-22305, Wednesday, May 24, 1978. 2 append.

Descriptors: *Flood plains, *Wetlands, *Legal aspects, *Federal government, Floods, Rivers, Water policy, Protection, planning, Regulation, Coasts.

This rule adds a new subpart to the Small Business Administration regulation part 116 in order to implement Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Policy and procedures are being established for carrying out the Agency's financial assistance program in accordance with these Executive Orders. (Stihler-Mass)
W79-03152

PROTECTION OF WETLANDS.
Soil Conservation Service, Washington, DC.
Federal Register, Vol. 43, No. 127, p 28787-28788, Friday, June 30, 1978.

Descriptors: *Wetlands, *Federal government, *Protection, Marshes, Wildlife, Irrigation, Planning, Water policy, Regulation, Water supply.

These proposed rules codify SCS policy for compliance with Executive Order 11990, Protection of Wetlands in SCS assisted programs. They describe the policy and general constraints placed on SCS personnel when considering the protection of wetlands in carrying out SCS assisted actions in programs administered by SCS. Handbooks and internal guidelines of SCS are being revised and amended to address the specific procedural details of compliance with E.O. 11990. (Stihler-Mass)
W79-03153

THE PUBLIC DECIDES ABOUT WEATHER MODIFICATION,
Colorado Univ., Boulder. Human Ecology Research Services.
For primary bibliographic entry see Field 3B.
W79-03155

RED RIVER OF THE NORTH BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-03156

ENVIRONMENTAL AND ECONOMIC PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE BURNS WATERWAY HARBOR, INDIANA.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03157

CONSIDERATION OF FLOOD PLAINS AND WETLANDS IN DECISIONMAKING.
General Services Administration, Washington, DC.
Federal Register, Vol. 43, No. 101, p. 22309-22311, Wednesday, May 24, 1978.

Descriptors: *Wetlands, *Flood plains, *Federal government, Floods, Effects, Water policy, Regulation, Institutions, Protection.

This notice is intended to inform the public of the action that will be taken within the General Services Administration to minimize the impact of floods on human safety, health and welfare; to minimize the destruction, loss or degradation of wetlands; and to preserve and enhance the natural beneficial value of flood plains and wetlands. (Stihler-Mass)
W79-03175

FLOODPLAIN AND WETLANDS MANAGEMENT.
National Aeronautics and Space Aministration, Washington, DC.
Federa Register, Vol. 43, No. 112, p 25317-25318, Friday, June 9, 1978.

Descriptors: *Flood plains, *Wetlands, *Protection, *Federal government, Water policy, Legal aspects, Management, NASA.

NASA proposes to provide rules for its implementation of Executive Order 11988--Floodplain Management and Executive Order 11990--Protection of Wetlands. These rules are temporary and provide broad guidance to NASA field installations for the immediate uniform implementation of the Orders. (Stihler-Mass)
W79-03179

THE COMPARATIVE STUDY OF ENVIRONMENTAL POLITICS: FROM GARBAGE TO GOLD,
Uppsala Univ. (Sweden). Dept. of Political Science.
L. J. Lundqvist.
International Journal of Environmental Studies, Vol. 12, No. 2, 1978, p 89-97. 44 ref.

Descriptors: *Political science, Research priorities, *Review, *Environmental politics, *Interest groups, *Governments, Political aspects, Political constraints, Environmental effects, Environment, Ecology, Social participation, Policy, Administration, Social values, Social aspects.

A literature review of comparative environmental politics and policy stresses the specific responsibility of political science in the process of political change; political scientists should avoid encroaching on the fields of ecology, engineering, or philosophy. Several propositions needing further testing and research are derived from the literature: (1) the more open and conflict-oriented the political system, the more immediate and substantial its reponse to demand for environmental policy, but the less substantial and successful its implementation of policy; (2) the more closed and consensus-oriented the political system, the slower and less substantial its response to demands for policy, but the more substantial and successful its implementation of policy; (3) the more short-term and particularistic the issue pursued by an environmental pressure group, the more democratic the group's internal structure and the more unorthodox and outsider-oriented its strategies of action; (4) the more long-term and general the issue pursued by an environmental pressure group, the more elitist the group's internal structure, and the more orthodox and insider-oriented its strategies for action; and (5) over time, environmental groups tend to perceive their issues and goals in more eternal and general terms, and the groups tend to become more and more elitist in structure and insider-oriented in their strategies. (Lynch-Wisconsin)
W79-03189

WATER RESOURCES PROJECT TYPE ACTIVITIES: CHANNEL MODIFICATION GUIDELINES.
Fish and Wildlife Service, Washington, DC. and Soil Conservation Service, Washington, DC.
Federal Register, Vol. 43, No. 41, p. 8276-8280, Wednesday, March 1, 1978. 1 tab.

Descriptors: *Channeling, *Federal government, *Legal aspects, *Regulation, Streams, Habitats, Wildlife, Wetlands.

An interdisciplinary team of specialists from the Fish and Wildlife Service and Soil Conservation Service worked cooperatively to develop these guidelines for channel modification. Guidelines are based on these professionals' own judgment and the suggestions of many other agencies, organizations and individuals. (Stihler-Mass)
W79-03190

THE EXCLUSIVE ECONOMIC ZONE: A CRITIQUE OF CONTEMPORARY LAW OF THE SEA,
Z. A. Kronfol.
Journal of Maritime Law and Commerce, Vol. 9, No. 4, p 461-479, July 1978.

Descriptors: *International waters, *Law of the Sea, *Exclusive economic zone, *United Nations, *Commercial fishing, *Resource extraction, *Jurisdiction, International law, Coasts, Governments, Natural resources, Oceans, UNCLOS III, Shipping, Maximum sustainable yield, Scientific research, Access, Water pollution control, Legal aspects.

A critical assessment of the 200-mi exclusive economic zone (EEZ), being considered by the Third United Nations Conference on the Law of the Sea (UNCLOS III), concludes that such fragmentation of ocean space among more than 100 nations would significantly obstruct vital transnational users of the marine environment. However since adoption of the EEZ is almost certain, the main hope is to retain insofar as possible the rights of the internations community within the zone, focusing on functional rather than territorial sovereignty. Activities or entities adversely affected by EEZ recognition include navigation, commecial fishing, resource extraction, access by land-locked or 'geographically disadvantaged' states, scientific research, conservation, and water pollution control. Under the proposed rules the EEZ would remove

out 36% of the ocean surface from international risdiction and endorse it under national jurisdic-n, rendering meaningless the 1970 General As-nbly Declaration of Principles Governing the a-Bed. Nearly half the ocean area thereby en-osed would be apportioned to high income coun-es--Canada, U.S., Australia, New Zealand, pan, some Eastern European countries, U.S.S.R., d South Africa--while just over half would go to e poorer countries. The EEZ is neither a com-ehensive solution nor an adequate one, and as ch coutries would receive relatively greater bene-s, world economic disparities would widen. ynch-Wisconsin)
79-03193

N APPROACH TO THE OPTIMAL CON-ROL OF POLLUTION IN BOUNDARY ATERS,
uelph Univ. (Ontario). Dept. of Economics.
or primary bibliographic entry see Field 5G.
79-03195

EGAL RIGHTS IN POTOMAC WATERS, ROCEEDINGS OF A CONFERENCE AT ARPER'S FERRY, WEST VIRGINIA.
terstate Commission on the Potomac River asin, Bethesda, MD.
eld May 14, 1976, Published September 1976. eport ICPRB General Publication 76-2, 213 p., 2 g, 7 tab, 6 append. Edited by G. Power and R. K. oloszyn.

escriptors: *Potomac river, *Water utilization, Conferences, *River basins, Consumptive use, Di-ersion structures, Federal jurisdiction, Maryland, ennsylvania, Virginia, West Virginia, District of olumbia.

his is a compiltation of papers presented at a nference of the Interstate Commission on the otomac River Basin to air differing perspectives nd define Basin issues. The papers address water upply issues facing the Potomac Basin including: there need for an agency with overall water esource planning and management powers; how hould water be priced in the Washington metro-olitan area; should proposed U.S. Army Corps of Engineers dams and reservoirs be constructed; do he states of West Virginia and Pennsylvania have he power to divert Potomac waters into other asins; under present law, must Virginia and the Corps of Engineers obtain permission from the tate of Maryland before appropriating Potomac vaters; and must specific statues of the various tates be changed in order to achieve an economi-ally efficient allocation of water resouces. Several apers are footnoted, providing references to origi-al source material. Appended material includes: a roposed bill authorizing the construction of a vater diversion structure on the river; proposed mendments to currently applicable law; a state-nent by the federal Environmental Protection Agency, a consumptive use study; and a copy of he Potomac River Law Flow Allocations Agree-nent. (Fortin-Florida)
W79-03197

THE DEVELOPMENT OF REGIONAL MPACT REVIEW PROCESS AND ITS APPLI-CATION TO GENERAL DEVELOPMENT COR-PORATION'S PORT MALABAR DEVELOP-MENT IN PALM BAY AND BREVARD COUNTY, FLORIDA,
Florida Univ., Gainesville. School of Law.
J. Corbett.
Available from Eastern Water Law Center, Uni-versity of Florida, Gainesville, Florida, 32611, 1978. 35 p, 2 append.

Descriptors: *Environmental effects, Project plan-ning, *Florida, *Land development, Environment, Ecology, Environmental control, Legal aspects, Regulation, Administrtion, Local government, Legislation.

The Development of Regional Impact (DRI) proc-ess is an integral part of the Florida Environmental Land and Water Management Act. A DRI is a development which would have a substantial effect upon the health, welfare, or safety of citizens of more than one county. This article covers: the threshold question of whether a development is one of regional impact; DRI's which are vested and therefore not subject to the DRI review proc-ess; the review process from application to appeal; and the enforcement mechanisms available. The DRI process is illustrated by application to a de-velopment project located in Palm Bay and Bre-vard County. Not only does the DRI process insure an in-depth analysis of long regional impacts of the project, but the process also allows local government to condition approval of the develop-ment. These benefits accrue to Palm Bay and Bre-vard County over and above normal land use controls. Rather than a final solution, the DRI process' effectiveness in addressing regional prob-lems will depend on how well local governments exercise their responsibility. (Rule-Florida)
W79-03198

SIGNIFICANT MANAGEMENT ISSUES IN THE LAW OF THE SEA CONFERENCE: ILLU-SIONS AND REALITIES,
F. Mirvahabi.
San Diego Law Review, Vol. 15, No. 3, p 493-524, 1978.

Descriptors: *Fisheries, *Law of the sea, *United nations, *Conferences, International waters, Trea-ties, Oceans, Conservation, Technology, Explora-tion, International law, Fish management.

Several significant fishery issues are left unsettled by the Third United Nations Law of the Sea Conference. This article discusses these problems and hypothesizes the conseuquences of non-agree-ment of the Conference with respect to fisheries. However, the author believes that the Conference will eventually reach a satisfactory conclusion and resulting treaty. The various maneuvering and ne-gotiating techniques among the different factions of nations participating in the Conference are ana-lyzed. Three major areas are explored. These are the 200-mile exclusive economic zone, conserva-tion regimes and regional fishery problems. Each of these areas is examined through a review of the problem, the Law of the Sea Conference approach, the treaty approach and the non-treaty solution. The various proposals on global conservation of fisheries which have been made by fishery experts fall into two categories. The first establishes global standards while mixing the rights and duties of the individual state with those of regional and global organizations. The second proposal suggests that the Committee on Fisheries manage the problem on a worldwide basis. The author suggests adop-tion of the latter proposal with several suggested additions. (Quarles-Florida)
W79-03199

SUPREME COURT STRIKES NEW BALANCE IN FEDERAL-STATE TENSION OVER WEST-ERN WATER RIGHTS.
Environmental Law Reporter, Vol. 8, No. 9, p. 10182-88, September, 1978.

Descriptors: *Federal-state water rights conflict, *Federal reclamation law, *Arid lands, *Judicial decisions, Surface waters, Appropriation, Prior ap-propriation, Federal government, Environmental control, Forest watersheds, Forest management, Constitutional law.

Two recent decisions of the United States Supreme Court have directly affected the authority of feder-al agencies to acquire, use, or distribute surface waters in the western states. The cases, California v. United States and United States v. New Mexico, are seen by the author as marking a change in direction, if not an about-face, from the previous state of the law in this area. The cases represent a watershed in the history of the federal-state rivalry over the use of western water. California v. United States involves a restrictive reading by the Court of the 1902 Reclamation Act. United States v New Mexico deals with the 1960 Multiple-Use-Sustained Yield Act, a federal act involving national forests. The long-standing conflict between the western states and the federal government over control of water rights is traced in order to provide historical perspective. Both the principal cases and related decisions are analyzed in detail. Through this anal-ysis and by way of comment, the author attempts to set out the environmental implications of these and related decisions. (Hucks-Florida)
W79-03200

RESOURCE DEVELOPMENT AND THE SEABED REGIME OF UNCLOS III: A SUG-GESTION FOR COMPROMISE,
National Security Council, Washington, DC. Inter-agency Task Force on Law of the Sea.
M. A. Conant, and C. G. Conant.
Virginia Journal of International Law, Vol. 18, No. 1, p 61-68, Fall, 1977.

Descriptors: *Law of the sea, *Exploitation, *Ne-gotiation, *United nations, International law, Oceans, Ownership of beds, International waters, Natural resources, Economics, Treaties.

The Third United Nations Conference on the Law of the Sea cannot conclude a comprehensive law of the sea treaty until agreement is reached regard-ing expolitation of seabed resources in the area beyond national jurisdiction. Changing circum-stances have led the 'Group of 77,' a coalition of more than 100 developing countries with common interests within the United Nations system, to change the terms on which resource exploitation may take place within their countries. These na-tions feel they possess unqualified sovereignty over their natural resources. However, United States negotiating principles may be so narrowly defined that these changing circumstances are not appreci-ated. The basic conditions the developed and de-veloping nations have set on the solution of the seabed regime problem may suggest a compromise solution. The U.S. seems to insist upon seabed exploitation terms which other developed coun-tries do not regard as essential. Although U.S. companies view the concept of joint ventures in a unitary system with apprehension, European inter-ests appear willing to accept this arrangement, which may help break the present deadlock in seabed negotiations. (Rule-Florida)
W79-03201

TERRITORIAL STATUS OF DEEPWATER PORTS,
G. L. Dunfee.
San Diego Law Review, Vol. 15, No. 3 p 603-22, 1978.

Descriptors: *Offshore platforms, *International law, *Deep water, *Ships, United States, Coasts, Legislation, Local government, Oceans, Jurisdic-tion, Economics, Oil industry.

The rapid growth of the world's supertanker fleet has created the need for deepwater ports to accom-modate them. The legal status of these offshore ports is not recognized by existing sea convention law. The necessity of granting territorial status to deepwater ports is examined in this article. The first unilateral declaration dealing with deepwater ports, the United States' 1974 Deepwater Port Act, is discussed. The author concludes that the ports are deserving of territorial status, or at least should be allowed an encompassing territorial sea. Suport of territorial status for superports is historical. They are similar in function to both the traditional roadstead and the port. Due to their important coastal purpose, local governments have an inter-est in regulating superport activities. At the very least, deepwater ports should be used to delimit coastlines. Alternatively, a three-mile territorial sea should be recognized around the ports. Future international agreements should be aware of the special problems of these ports. Finally, freedom of the high seas must be balanced against the need for deepwater ports. Because of national security, en-vironmental control and navigational safety, super-ports must have territorial status. (Quarles-Florida)
W79-03202

LEGAL CLAIMS TO NEWLY EMERGED ISLANDS,
J. L. Verner, Jr.
San Diego Law Review, Vol. 15, No. 3, p 525-45, 1978.

Descriptors: *Islands, *International law, *Land forming, *Volcanoes, Pacific Ocean, United States, United Natons, Treaties, Continental shelf, Technology, Exploitation.

As a result of some volcanic activity, it now appears that a new island may be rising out of the Pacific Ocean between the Volcano and the Mariana Islands. This article poses the question of which country the new land would belong to. Four theories of international law are examined. Two predicate claim to a new island on an existing claim to the seabed from which it arose. The 1958 Geneva Convention and the doctrine of occupation are in this class. The doctrines of occupation and discovery assume that a new island would be a territory owned by no one. Occupation consists of exercising control over a territory, while discovery involves finding and then formally annexing territory. The article concludes that only the latter two doctrines could be used in this situation. The undersea geography of the area and the distance from other land would preclude the other doctrines' use. Whether a legal claim to a new island would be pressed by any nation is a matter of conjecture, due to the desired international harmony necessary for settlement of ongoing Law of the Sea Conference negotiations. (Quarles-Florida)
W79-03203

UNITED STATES INTERESTS IN A CONVENTION ON THE LAW OF THE SEA: THE CASE FOR CONTINUED EFFORTS,
Vanderbilt Univ., Nashville, TN. School of Law.
J. I. Charney.
Vanderbilt Journal of Transnational Law, Vol. 11, No. 1, p 39-75, Winter, 1978. 1 app.

Descriptors: *Conferences, *Negotiations, *Law of the Sea, *United Nations, International waters, Fish management, Navigation, Military aspects, Exploitation, Research and development, Oceans, Adoption of practices.

The ongoing United Nations Conference on the Law of the Sea has covered a broad range of issues involving relations between nations with respect to the Oceans. Issues covered include: (1) fishing; (2) national jurisdictions; (3) navigation; (4) environment; (5) scientific research; (6) seabed exploitation; and (7) transfer of technology. The current product of that negotiation is the Informal Composite Negotiating Text (ICNT) containing 303 treaty articles and seven annexes. United States interests in the Conference include: (1) the impact of these negotiations on multilateral relations; (2) the Conference's precedential effect on other international issues; (3) the future use of the Conference negotiating processes; and (4) the development of a third party dispute settlement system in international relations. The United States' substantive interests in the Conference include: (1) the exploitation of the sea's living resources; (2) protection of the marine environment; (3) the conduct of marine scientific research; (4) military and commercial freedoms of ocean navigation and use; and (5) the exploitation of the non-living deep seabed resources. These interests are analyzed in the context of an existing Convention as well as the non-convention alternative. Tables are included. (Goldberg-Florida)
W79-03204

ELEVENTH HOUR AMENDMENT TO FWPCA RESUSCITATES EPA'S HAZARDOUS SUBSTANCE DISCHARGE PROGRAM,
Environmental Law Reporter, Vol. 8, No. 11, p 10229-31, Nov. 1978.

Descriptors: *Federal water pollution control act, *Administrative agencies, *Regulations, *Water quality standards, Water pollution, Chemical wastes, Federal government, Ecology, Navigable wates, Pollutants, Pollution abatement.

This is a summary of recent Congressional action amending Section 311 of the Federal Water Pollution Control Act. Section 311 prohibits the discharge of oil on designated hazardous substances from vessels and both onshore and offshore facilities into the navigable waters of the United States, onto adjoining shorelines, or into waters of the contiguous zone. The passage of the amendment, which occurred on the next to the last day of the 95th Congress is seen as breathing new life into the federal program for the regulation of hazardous substance spills into the nation's waters. The legislative history of Section 311 is traced in detail. Also discussed are the problems which were faced by the federal Environmental Protection Agency (EPA) when trying to promulgate regulations implementing the provisions of Section 311. A major stumbling block for the EPA was a federal district court decision, Manufacturing Chemists Association v. Costle, which invalidated EPA regulations governing spills and discharges of hazardous chemicals as being inconsistent with the explicit requirements of Section 311. The impact of this case is discussed. (Hucks-Florida)
W79-03205

MINIMUM STREAMFLOWS: THE LEGISLATIVE ALTERNATIVES,
L. P. Hendrix.
Nebraska Law Review, Vol. 57, No. 3, p 704-29, 1978.

Descriptors: *Streamflow, *Irrigation, *Nebraska, *Competing uses, Irrigation effects, River flow, Ecosystems, Regulation, Agriculture, Environmental effects, Intermittent streams, Water utilization.

The concept of 'minimum streamflow,' as applied to Nebraska rivers and streams, is discussed in this article. The term 'minimum streamflow,' as used by the author, means the preservation of instream values - fish, wildlife, recreation, aesthetics, and the environment. The focus of the article is on the dilemma faced by Nebraska legislators when trying to draft streamflow controls. The history of Nebraska as a state dependent on agriculture as an economic resource is traced. Discussed is the role that irrigation plays in supporting and preserving the agriculture industry as are the environmental dangers which result from an uncontrolled use of irrigation. The dangers include intermittent streamflow, dewatering of streams, disruption of ecosystems and the widespread killing of fish and other waterlife. An attempt is made to explore both sides of the issue. The position of environmental groups, such as the Sierra Club and the Audobon Society, who favor maintaining streams in as natural a condition as possible, is contrasted and compared with farmers' interests, which favor legislation maximizing the amount of freshwater available for irrigation. (Hucks-Florida)
W79-03206

STATE OWNERSHIP OF BEDS OF INLAND WATERS - A SUMMARY AND REEXAMINATION,
Missouri Univ. - Columbia. School of Law.
P. N. Davis.
Nebraska Law Review, Vol. 57, No. 3, p 665-703, 1978, 1 tab.

Descriptors: *Ownership of beds, Streams, *Federal-state water rights conflicts, *Inland waterways, State jurisdiction, Federal jurisdiction, Navigable waters, Grants, Proprietary power, Regulation, Rivers, Lakes.

This article summarizes the basic structure of bed title law, focusing on state ownership of the beds of streams, rivers and lakes. State regulatory and proprietary interests which are furthered by such ownership are explored in depth. These include licensing of bed use, leasing of underlying mineral rights, protection of public use rights, assertion of public trust powers and location of boundaries of abutting privately-owned land. The current law affecting state ownership in states created from federal territories is examined. Through the method of case analysis, the criteria used by federal courts when the extent of state ownership of beds formerly federally-owned is explored. Among these criteria are (1) the 'equal footing' rule; (2) the law of federal and patent interpretation; (3) state rules on incidents to title to abutting uplands; (4) federal and state definitions of navigability; and (5) the law of implied grants of land from the sovereign. The law of bed ownership is traced from its common law roots up through current state and federal statutes. Recent Supreme Court decisions affecting this area are discussed and analyzed. (Hucks-Florida)
W79-03207

THE FATE OF NON-COMPLIANT MUNICIPALITIES WITH REGARD TO THE SECONDARY TREATMENT STANDARDS PURSUANT TO THE 1972 FEDERAL WATER POLLUTANT CONTROL ACT AMENDMENTS - A PROBLEM OF ENFORCEMENT,
T. Bondurant.
University of Richmond Law Review, Vol. 12, No. 3, p 581-91, Spring, 1978.

Descriptors: *Federal water pollution control act, *Municipal wastes, *Adsorption of practies, *Law enforcement, Administrative agencies, Legislation, Waste water(Pollution), Permits, Waste water treatment, Remedies, Water quality standards, Cities.

The evolution of the Federal Water Pollution Control Acts (FWPCA) of 1948, 1956, 1965 and 1972 shows the pre-emption of the federal government in water pollution legislation. Individual states failed to enforce water pollution legislation, probably due to fear of driving industry from the state. Thus the federal Environmental Protection Agency (EPA) became the implementor of the 1972 Act. As of July, 1977, about one-half of all municipalities failed to comply with secondary treatment and water quality standards established by the FWPCA. Attributable to the non-compliance are arguments of a general administrative failure and unrealistic and arbitrary deadlines due to insufficient funding of the construction grant program and technical impractibilities. Non-complying municipalities are subject to civil, criminal, and injunctive sanctions but these are impractical and may be unfair to financially strapped municipalities. Thus, the EPA must develop an ad hoc enforcement scheme to preserve the 1972 Act's integrity, while sparing 'faultless' municipalities. The recommended EPA extra-permit mechanism for these 'good-faith' municipalities is the Enforcement Compliance Schedule Letter (ECSL), which extends the deadlines. Two other extra-permit mechanisms that are used to achieve identical results are the court order schedule and the consent order. (Horwich-Florida)
W79-03208

PUEBLO INDIANS' WATER RIGHTS, NEW MEXICO V. AAMODT, 537 F.2D 1102 (10TH CIR 1976),
W. J. Busch.
Denver Law Journal, Vol. 54, No. 1-2, p 302-12, 1977.

Descriptors: *New Mexico, *Water utilization, *Judicial decisions, *Pueblo water rights, Distribution systems, Appropriation, Reservation doctrine, Competing uses, Priorities, Indian reservations, Treaties, Water resources.

The New Mexico case of New Mexico v. Aamodt was brought to determine the state's water rights. The parties were the United States, New Mexico, private landowners and the Pueblo Indians. The district court held that the Indians' water rights are subject to the New Mexico appropriation system. The circuit court reversed, holding that the Indians' rights are superior to all claims except non-Indians claiming adverse possession prior to 1858, and possibly others not relevant here. But the majority declined to define fully the nature of the Indians' rights, and remanded the case for an analysis of the origin of their water rights. Two issues that need to be resolved are the nature of the Indians' aboriginal rights and the quantification

nd priorities system to be used in water distribu-on. The author argues that an ultimate disposition f the Pueblos' aboriginal rights in the manner of he disposition of Native Alaskan rights should be voided. The justice of trading money for re-ources that cannot be replaced by purchase is uestionable. This is especially true in the Pueblo's outheastern area, where the water supply is inad-quate and the land is worthless without water ights. (Horwich-Florida)
W79-03209

A FEE SIMPLE IN WATER OR A TREND TOWARD FAVORING CITIES. CITY OF GRAND JUNCTION V. KANNAH CREEK WATER USERS ASSOCIATION, 557 P.2D 1173 (COLO. 1976),
E. B. Pickell.
Denver Law Journal, Vol. 55, No. 1, p 153-65, 1978.

Descriptors: *Colorado, *Water rights, *Judicial decisions, *Condemnation, Appropriation, Water supply, Cities, Eminent domain, Water storage, Reservoirs, Reservoir storage, Compensation.

The Colorado case of City of Grand Junction v. Kannah Creek Water Users Association had its origin in 1911, when Grand Junction, in an emi-nent domain proceeding, acquired direct-flow water rights from agricultural appropriators. The judgement awarded the city rights to a continuous flow, but made no express mention of storage rights. In 1973, the city instituted an action to include the right to store water in a reservoir acquired in 1954. Downstream appropriators pro-tested, alleging the city's action would diminish the water quality. The water judge denied storage rights, holding that the city could not divert to the reservoir water not immediately required. The Colorado Supreme Court reversed, distinguishing between water rights acquired by condemnation and by appropriation. It held that the storage right was implied, and was not lost by more than 50 years of non-use, though it would be under appro-priation. The author argues that the court disre-garded existing Colorado water law in allowing the city to acquire a fee simple in water taken by condemnation, and that further compensation was due the farmers. But the decision may be indicative of an emerging policy to ensure that cities have adequate water supplies in times of shortage. (Hor-wich-Florida)
W79-03210

STORING WATER UNDERGROUND: WHAT'S THE AQUI-FER,
Nebraska Univ., Lincoln. School of Law.
N. W. Thorson.
Nebraska Law Review, Vol. 57, No. 3, p 581-632, 1978.

Descriptors: *Underground storage, *groundwater resources, *Aquifer systems, *Arid land, Storage, Arid climates, surface water availability, Temporal distribution, Groundwater recharge, Resource al-location, Planning, Public rights.

The elements of a meaningful system of under-ground water storage rights are examined herein. Ways in which apparent conflicts between the requirements of such a system and presently vested subsurface property rights might be resolved are suggested. Analysis is conducted on three levels. First, the various theories of existing subsurface property rights are examined. These include: (1) the right to store; (2) the right to protect; and (3) the right to recapture. Next, potential conflicts between such existing rights and those elements necessary to a meaningful system of underground water storage rights are identified. Areas of poten-tial conflict include: the allocation of storage rights when storage space is scarce relative to demand; and the resolution of conflicts between ground-storage rights and other property rights. Finally, the author attempts to resolve and avoid potential conflicts by analogizing to the law of surface waters and the law of wild animals. The geograph-ical focus of this article is on the semi-arid western states, where the supplies of usable water are often geographically isolated from the areas of greatest demand. (Hucks-Florida)
W79-03211

WATER AS A LOCATABLE MINERAL: THE HERESY OF THE CHARLESTONE CASE,
E. M. Hill.
North Dakota Law Review, Vol. 54, No. 3, p. 365-74, 1978.

Descriptors: *Water law, *Groundwater, *Water rights, Water resources, Water users, Groundwater mining, Prior appropriation, Mining, Aquifers, Nevada.

In Charlestone Stone Products, Inc. v. Andrus, a federal district court ruled that water may be clas-sified as a 'mineral,' that Congress has manifested no intention of excluding water from the general category of minerals locatable under the 1872 fed-eral Mineral Location Act, and that therefore water is locatable. Affirmed on appeal, the Su-preme Court will review the decision, the sole review issue being whether or not water is a loca-table mineral under the 1872 Act. Unless and until the Charlestone case is overturned, the potential impact on both mining and western groundwater laws is considerable. The decision ignores Con-gressional policy concerning water rights and sets the stage for the destruction of state regulation of water rights in the arid western states. This is so because if water is a mineral locatable under the 1872 Act, a 'miner' is free to install wells on the public domain, and totally deplete the 'mineral deposit' (ground water aquifer) with inpunity against state laws regulating water appropriation and use. The Charlestone decision should be re-versed. (Fortin-Florida)
W79-03212

WATER USE PERMITS IN A RIPARIAN STATE: PROBLEMS AND PROPOSALS,
Kentucky Univ., Lexington. School of Law.
R. C. Ausness.
Kentucky Law Journal, Vol. 66, No. 2, p. 191-265, 1977-78.

Descriptors: *Kentucky, *Water rights, *Water allocation(Policy), *Evaluation, Natural flow doc-trine, Reasonable use, Prescriptive rights, Prior appropriation, Groundwater, Consumptive use, Water resources, Common law.

Although adequate supplies of water are generally available in Kentucky, state law governing its use and allocation are less than satisfactory. Kentucky water law is a complex mixture of common law and statutory water rights. This article attempts to evaluate these rights while suggesting improve-ments. Common law rules, as they relate to surface water and groundwater, are examined. Kentucky's system of statutory water use regulation is ex-plored, with some of the statutory's scheme's more serious deficiencies noted. Short-range legislative changes are recommended, and constitutional issues are accordingly discussed. Long-range alter-natives are briefly considered. The common law rules are said to be uncertain, especially regarding surface water. Under Kentucky's present water regulatory law, significant deficiencies remain. The article sets forth a proposal to serve as a model replacement of the present water allocation law. The proposed law would provide the water regula-tory agency with enough authority to implement a state water resources policy without unnecessary interference to private water users. The proposal also abolishes common law water rights without violating substantive due process of law tenets. (Quarles-Florida)
W79-03213

ERRONEOUSLY MEANDERED LAKESHORE-THE STATUS OF THE LAW AS IT AFFECTS TITLE AND DISTRIBUTION,
J. H. Ohlander.
Marquette Law Review, Vol. 61, No. 3, p. 515-33, Spring 1978.

Descriptors: *Wisconsin, *Meanders, *Lakes, *Boundary disputes, Legal aspects, Recreation, Surveys, Judicial decisions, Land development, Boundaries(Property), Riparian land.

Increased affluence, coupled with interest in out-door recreation, have resulted in an increasing demand for lake and country real estate in Wiscon-sin's northern woodlands. Purchasers may one day find themselves embroiled in disputes over titles to parcels of land which were either mistakenly or fraudulently omitted from the original government surveys. Unfortunately, the applicable law in this area is cryptic and uncertain. However, recent decisions by the Wisconsin Supreme Court have sought to clear up the state of the law. It is clear that when the United States distributes land ac-cording to the official plat which depicts meander lines along the margin of an existing body of water, the actual shoreline defines the extent of the grant. Therefore, the owner of land abutting a lake on the official plat is pressured to hold the water's edge. Wisconsin has a 48-year old statute which provides for the equitable distribution of omitted lands in a manner consistent with federal decisions. Two recent Wisconsin cases, read in conjunction with one another, provide for such distribution without a return to the older cases which are inconsistent with federal law. (Quarles-Florida)
W79-03214

CUSTOM AND LAND-BASED POLLUTION OF THE HIGH SEAS,
J. E. Hickey, Jr.
San Diego Law Review, Vol. 15, No. 3, p 409-75, 1978.

Descriptors: *International law, *Water pollution control, *Oceans, *Pollution abatement, Treaties, Judicial decisions, United Nations, Law of the Sea, Technology, Economics, Political aspects, Interna-tional law.

The introduction of land-based waste to the high seas becomes a problem when it results in the pollution of the marine environment. To qualify as pollution that would be covered by general cus-tomary international law, the result must be real or potential material damage. Only then does the gen-eral principle of international law come into play, that being 'sic utere tuo'--one must so use his own as not to do injury to another. Evidence of the obligation not to pollute the high seas in this manner is found in the protests of states, bilateral and multilateral treaties, judicial decisions, the ac-tivities of the United Nations, declarations of re-gional organizations, a growing body of municipal legislation, and work of the International Law Association. Evidence from these sources is ex-plored. There is a growing tendency to apply a strict standard of liability without regard to fault for the violation of the customary international law obligation not to pollute. However, the interna-tional community has made only an initial foray into the control of land-based pollution. Technol-ogy, politics and economics will play a vital role in this area. (Quarles-Florida)
W79-03215

INTERNATIONAL GROUNDWATER MAN-AGEMENT: THE CASE OF THE U.S. - MEXI-CAN FRONTIERS,
New Mexico Univ., Albuquerque. Coll. of Law.
A. E. Utton.
Nebraska Law Review, Vol. 57, No. 3, p. 633-63, 1978.

Descriptors: *Groundwater resources, *Resources allocation, *Mexico, *United States, International bound and water commission, International Law, Groundwater, Subsurface waters, Aquifer manage-ment, Groundwater availability, Future planning(Projected), Management.

Those states contiguous to Mexico are the United States' heaviest groundwater users, but have inad-equate law and institutions to control this exploita-tion. Additionally, even though the Internatonal Boundary and Water Commission has done a great deal toward resolving groundwater problems. in-

ternational competence over aquifers divided by the border is not defined. The government of Mexico can regulate groundwater extraction through its Secretariat of Water Resources, which can establish prohibited groundwater zones if it is in the public interest. An anticipated increasing investment in groundwater facilities and concurrent demand on the groundwater resources divided by the national border, coupled with the absence of dispute resolution or management institutions increases the potential for Mexican-U.S. dispute over resource control. The economic context and alternative institutional opportunities are examined in this article, while possible management options are investigated. Equitable apportionment, case-by-case negotiation, and comprehensive management are considered, as is international litigation. Whatever options or combinations of options are chosen. It would be better to reach agreement rather than gamble with the uncertainties inherent in litigation before the International Court of Justice. (Rule-Florida)
W79-03216

REGIONAL LAW OF THE SEA: A PROPOSAL FOR THE PACIFIC,
Micronesia Congress. (Trust Territory of the Pacific Islands).
F. L. Ramp.
Virginia Journal of International Law, Vol. 18, No. 1, p. 121-32, Fall 1977.

Descriptors: *International law, *Commercial fishing, *Regional analysis, *Pacific Ocean, Water resources management, Resource allocation, Regional economics, United Nations, Management, Fish management, Law of the Sea, Regional development.

Central and western tropical Pacific states and territories consist mostly of very small islands clustered together into political and cultural groups. Foreign fishing vessels, mostly Japanese, harvest most of the fish taken in the area with little concern for conservation and management. Pacific states are now preparing to take advantage of the 200-mile economic zone giving them resource ownership rights over these fishing areas, thus changing the area's history of free access. Regional law of the sea arrangements in the Pacific would promote shared legal claims and provide efficient use of regional waters, as well as aid individual ends. Common interests and needs in the regions include: effective management of highly migratory species of fish, collection of scientific data, avoidance of wasteful and destructive investment policies, equitable treatment for all states and territories in the region, and enforcement. A major benefit to member states would be the ability to negotiate with distant water fishing states. A large portion of the exclusive economic zone waters of the region belong to territories that are less than fully independent states. The informal Composite Negotiating Text of UNCLOS III should protect their rights. (Rule-Florida)
W79-03217

THE UNITED NATIONS CONFERENCE OF THE SEA (PANEL DISCUSSION AT THE ANNUAL MEETING OF THE AMERICAN BAR ASSOCIATION SECTION OF INTERNATIONAL LAW),
American Bar Association, Chicago, IL.
International Layer, Vol. 12, No. 1, p. 21-62, Winter, 1978.

Descriptors: *Law of the Sea, *International wates, *Conferences, *United Nations, Oceans, Mining, Ownership of beds, International law, Negotiations, Resource allocation, Exploration, Exploitation.

Speakers at the American Bar Association Section of International Law's panel discussion on the United Nations Conference on the Law of the Sea included the head of the Mexican delegation to the Conference, Ambassador Jorge Castaneda. He discussed the exclusive economic zone, under which each coastal state has sorvereign rights to exploit and manage the living and nonliving ocean resources up to a distance of 200 miles from their coasts beyond a territorial sea of 12 miles. Bernard Oxman, deputy head of the United States delegation to the conference, discussed the legal problems inherent in the international law of the sea, and in the interpretation of the Informal Composite Negotiating Text, Myron Nordquist, member of the United States delegation and the State Department's Office of the Legal Advisor, remarked upon changes undergone by the Law of the Sea in the past few years. John Laylin, a member of the State Department's Advisory Committee on the Law of the Sea, discussed deep ocean mining, with emphasis on domestic legislation and possible future courses of action. Finally, the area of development of procedures for compulsory settlement of disputes was covered by Louis B. Sohn, Professor of International Law at Harvard Law School. All presentations and discussion are provided in this article. (Rule-Florida)
W79-03218

REFLECTIONS ON THE FINAL CLAUSES IN THE NEW LAW OF THE SEA TREATY,
S. Rosenne.
Virginia Journal of International Law, Vol. 18, No. 1, p. 133-46, Fall 1977.

Descriptors: *Treaties, *Law of the Sea, *International law, *United Nations, International waters, Legal aspects, Negotiations, Project planning, Conference, Analysis, Oceans.

The text of a treaty's 'final clauses' cannot be settled until the end of the treaty's negotiations. The Informal Composite Negotiating Text issued at the end of the Sixth Session of the Third United Nations Conference on the Law of the Sea included final clauses, primarily noncontroversial and nonsubstantive provisions regarding ratification, accession, entry into force, the status of annexes, the authentic tests, and the testimonium. These clauses are concerned with matters which arise before the entry into force of the treaty. Possible final clauses embodying substantive agreements on the application of the law of treaties or of general international law to this treaty include the question of the relationship of the proposed new convention with other treaties, especially the 1958 Conventions on the Law of the Sea, and the problem of reservations to the new convention. Eventually these clauses--which are traditionally the most controversial--will be drawn into the general negotiations. There are few precedents for the type of problems regarding the final clauses in the proposed convention on the Law of the Sea, thus constructive innovation and the highest degree of legal acumen will be called for. (Rule-Florida)
W79-03219

A NEW COMBINATION TO DAVY JONES' LOCKER: MELEE OVER MARINE MINERALS,
J. K. McCall.
Loyola University of Chicago Law Journal, Vol. 9, No. 4, p. 935-64, Summer, 1978.

Descriptors: *Manganese, *Mining, *Law of the Sea, *Negotiations, International waters, Mineral industry, Oceans, International law, Resources, Exploitation, Conferences, United Nations.

Manganese nodules, mineral conglomerations found on the ocean floors, have recently become the focal point of great interest on the part of industry, financial institutions and governments. The nodules, which have formed over millions of years, contain valuable deposits of nickel, copper, manganese and cobalt. The recent surge of interest in manganese nodules is attributable to increased world need for minerals and the advancement of technology necessary for retrieving the deposits. This increased interest has raised two important questions: (1) who is entitled to mine the nodules; and (2) under what conditions should mining operations be carried out. The complexity of these questions is furthered by the fact that the nodules do not lay within the territorial jurisdiction of any sovereign. Resolution of these questions is necessary for the expansion of this industry. The United Nations Conference on the Law of the Sea ha attempted for four years to negotiate a treaty ou lining the permissible scope of nodule minin Thus far the Conference has been unsuccessfu This article examines the current status of nodul mining and analyzes recent attempts by the Unite Nations and individual countries to institute minin guidelines. (Hucks-Florida)
W79-03220

IMPLIED RESERVATION CLAIMS AFTE CAPPAERT V. UNITED STATES,
C. S. Murray.
Arizona State Law Journal, Vol. 1977, No. 3, 647-72, 1977.

Descriptors: *Water allocation(Policy), *Reserva tion doctrine, *Federal-state water rights conflict *Desert land act, Water resources, Public lands Regulation, Federal jurisdiction, Water right Proprietary power, Arid lands, Competing use

In the arid western states water has become scarce and valuable natural resource. In respons to this scarcity various doctrines have been deve oped pertaining to rights of ownership and contro over water supplies. One such doctrine is implie reservation. When Congress sets aside land in th public domain for a particular purpose, it impliedl reserves water rights for the benefit of those re served lands--sufficient water to accomplish th intended purpose. The Supreme Court has recentl supported the implied reservation doctrine in Cap paert V. United States. The significance of th Capparet case is examined in detail. A framewor for the analysis of federal claims under the doctrin is offered. Two basic issues likely to arise unde the doctrine are analyzed: first, how the existenc or non-existence of a federally reserved water righ will be determined in a particular situation; an second, once the existence of such a right has bee established, how the reservation will be quantified Economic, social and political ramifications of th doctrine are discussed. (Hucks-Florida)
W79-03221

THE INTERRELATIONSHIP OF GROUND AND SURFACE WATER: AN ENIGMA TO WESTERN WATER LAW,
M. C. Haase.
Southwestern Nevada Law Review, Vol. 10, Spe cial Issue, p. 2069-87, 1978. 3 fig, 1 tab.

Descriptors: *Surface-groundwater relationships *Groundwater resources, *Water management(Applied), *Water conservation Groundwater recharge, Hydrologic budget, Re charge, Hydrology, Hydrologic aspects, Ground water potential, Aquifers, Water requirements.

Ground water as a direct or indirect source o water is not inexhaustible if consumption rate continue their rapid rise. Unplanned exploitation o ground water may affect surface water rights and water tables may be depressed. Allocation of avail able water among claimants could give rise to legal, administrative, and economic problems State and federal authorities must therefore stop dealing with water problems on an ad hoc basis and instead develop water use, allocation and con servation plans through the enactment and en forcement of viable and practical laws. However, before this can be done, the legal and judicial worlds must understand the interrelationship o hydrology to the total environment, especially the direct relationship between surface and ground waters. The most efficient method of providing resource management would appear to be zoning, which also has the benefit of avoiding serious conflicts with fifth amendment prohibitions and requirements. Coordination of the numerous fac tors that must be considered in land/water re source planning could be incorporated in a region al or national zoning agency. (Rule-Florida)
W79-03222

CONGRESS, THE COURT, AND WATER POL LUTION,
Chicago Univ. Law School, IL.

. P. Currie.
he Supreme Court Review, p. 39-63, Univ. of hicago Press, Chicago, Ill., 1977.

escriptors: *Federal water pollution control act, Administrative decisions, *Judicial decisions, Analysis, Water pollution, Legislation, Pollutants, dministrative agencies, Permits, Technology, tandards, Regulation.

he Federal Water Pollution Control Act (Act) rohibits the discharge of any pollutant with sever- specific exceptions provided in the Act. Several itical dates are provided in the Act for the imple- entation of the proper technology required for fluent limitations of point sources. In a recent nited States Supreme Court decision, the Court eld that the federal Environmental Protection gency Administrator may adopt 1977 and 1983 fluent limitations by regulation and that there is o requirement that he provide for variances from ie new-source standards. The first part of the olding, which has been the subject of constant tigation, is of virtually no practical significance. ndustry insists that effluent limitations should be et in the course of issuing individual permits, not y regulation. Lying behind this position is the ractical question whether the appropriate tech- ology required was to be determined on a nation- lly uniform or a plant-by-plant basis. However, his question does not depend upon whether the dministrator may adopt limitations by regulation. ither way, the question of flexibility and variation emains. The article concludes that the case leaves ie question unresolved. (Quarles-Florida)
V79-03223

IARD MINERALS ON THE DEEP OCEAN 'LOOR: IMPLICATIONS FOR AMERICAN .AW AND POLICY,
. F. Pietrowski, Jr.
Villiam and Mary Law Review, Vol. 19, No. 1, p. 3-75, Fall 1977.

Descriptors: *Law of the sea, *Mineral industry, Legislation, *United Nations, Oceans, United States, Legal aspects, International waters, Trea- ies, Negotiations, Jurisdiction, International law.

The Third United Nations Conference on the Law of the Sea recently reconvened for its sixth session. This article reviews the American deep-sea mining policy and maintains that, under existing interna- ional and domestic law, American companies may egally mine the seabed's resources. Moreover, be- cause the United States depends on foreign sources for minerals also, America should undertake unilat- eral action to encourage and protect deep-sea mining companies. Congress must assure American ndustries' access to the minerals of the deep seabed at a reasonable cost. If a treaty resembling the new Informal Composite Negotiating Text be- comes binding, prior ocean mining investments will be rendered worthless. Companies cannot be expected to invest further in deep-sea mining and risk great loss without congressional guarantee of protection. Without this guarantee, the ocean's mineral resources will remain beyond the econom- ic reach of American businesses. With such protec- tion, the United States can become self-sufficient in its needs for manganese, nickel, cobalt and copper. These conclusions are reached after an examina- tion of existing international law, proposed changes, and federal legislative efforts. (Quarles-Florida)
W79-03224

AGRICULTURAL WATER QUALITY ACT.
Hearing, Subcomm. on Conservation and Credit, Committee on Agriculture, U.S. House of Repre- sentatives, Sept. 16, 1977, Serial No. 95-EE, 44p.

Descriptors: *Agriculture, *Water quality stand- ards, *Water conservation, Future planning(Projected), Environmental effects, Con- servation, Negotiations, Farms, Irrigation, Drain- age practices, Water quality control.

This hearing of the Subcommittee on Conservation and Credit of the U.S. House of Representatives' Committee on Agriculture was called to discuss problems in the proposed Agricultural Water Quality Act--House Bill 8150--a bill to provide for the maintenance or enhancement of the quality of water in rural areas. Verbatim statements made before the Subcommittee by the following individ- uals are included: John Adams, director, Environ- mental and Consumer Affairs Division, National Milk Producers Federation; Thomas Barlow, Nat- ural Resources Defense Council; Lyle Bauer, vice president, National Association of Conservation Districts; Albert Erickson, Associate Deputy As- sistant Administrator for Water Planning and Standards, Environmental Protection Agency; James Jeffords, U.S. Rep. from Vermont; Robert Koch, president, National Limestone Institute, Inc.; Richard Swaim, executive director, Obion Forked-Deer Basin Authority; Tennessee; and Edward Thomas, acting administrator, Soil Con- servation Service, U.S. Department of Agriculture. Also included is a letter from Thomas Kimball, representing the National Wildlife Federation, con- taining informal comments on the proposed bill as well as formal Federation resolutions pertaining to its passage. A copy of the proposed bill is pro- vided. (Easterbrook-Florida)
W79-03225

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PORTLAND, ME.).
Hearings, Subcomm. on Environmental Pollution, Comm. on Environmental and Public Works, U.S. Senate, June 1, 1977, Serial No. 95-H25, Part 1, 263 p.

Descriptors: *Federal water pollution control act, *Continental shelf, *Federal jurisdiction, *Shore protection, Maine, Oil spills, Fisheries, Environ- mental control, New England, Legislation, Devel- oped waters, Coasts.

The U.S. Senate Subcommittee of Environmental Pollution met to hear testimony on federal water pollution law issues including: the environmental implications of the development of the Outer Con- tinental Shelf; the success of the Maine water pollution control program; progress and problems of the paper industry and its compliance with the Clean Water Act; and alternative treatment tech- nologies for small communities. The issues selected for this hearing were all of particular importance to the people of Maine and other Atlantic Coastal states. The citizens of those states value deeply the unique fishery and recreational resources which they have. One purpose of the hearing was to gather information necessary to assure environ- mental protection of Maine's water resources. The greatest threat to these resources lies with the risk of oil tanker accidents along the coast. Under new rules, the Subcommittee has expanded jurisdiction over ocean pollution problems and issues. The Federal jurisdiction extends to the 200-mile limit. The verbatim text of all statements given before the Subcommittee is included, as well as numerous maps, graphs and technical data tables. (Hucks-Florida)
W79-03226

WATER FOR FIVE CENTRAL ARIZONA INDIAN TRIBES FOR FARMING OPER- ATIONS.
Hearings, Select Committee on Indian Affairs, U.S. Senate, May 23 and 24, 1977, 623 p.

Descriptors: *Arizna, *Indian reservations, *Sur- face water, *Agriculture, Irrigation systems, Sur- face water availability, Administrative agencies, Aquifers, Costs, Legal aspects, Water rights.

Senate Bill 905 provides for the federal acquisition of existing water rights with the state of Arizona to secure a permanent water supply for five central Arizona Indian tribes as a settlement of their legal rights. The Bill also calls for the construction, extension, or rehabilitation of the water delivery systems within each reservation. The 'Winters' case gave the Arizona tribes legal rights to that quantity of surface water necessary to fulfill the purpose for which the reservations were created. These rights were further refined in the later case of Arizona v. California, setting up the standards of 'practicably irrigabel acreage'. This case granted the five tribes the legal rights to sufficient surface water to farm all 'practicably irrigable' lands. It was suggested that a legislative settlement would avoid costly and lengthy litigation. This document contains all verbatim testimony of witnesses relat- ing to the passage of Senate Bill 905. Witnesses include spokesmen for each of the tribes, various federal and Arizona governmental agencies, state and local water resources agencies and U.S. Senate Deconcini, Goldwater and Kennedy. Numerous maps, graphs and tables are also included. (Gold- berg-Florida)
W79-03227

OIL SPILL LIABILITY AND COMPENSA- TION.
Hearings, Committee on Commerce, Science, and Transportation, U.S. Senate, June 9, 10, & 20, 1977, Serial No. 95-27, 346 p.

Descriptors: *Oil spills, *Transportation, *Com- pensation, *Associated costs, Shore protection, Oil pollution, Oil industry, Environmental effects, Economic impact, Damages, Legislation, Adop- tion of practices.

These hearings before the U.S. Senate Committee on Commerce, Science, and Transportation ad- dressed the problems of oil spill liability and com- pensation. The Senate has already passed Senate Bill 682, The Tanker and Vessel Safety Act, which upgrades construction, operation, and manning standards for all vessels entering U.S. waters and ports. But, as long as oil moves on water, there will be oil spills, attendant damage and injured third parties. Despite several major oil spill inci- dents, there has yet to be enacted a law which compensates oil spill victims quickly and without great difficulty. Since oil spill damage is one of the economic costs of transporting and using petro- leum, these bills are intended to internalize those costs and thus show the true cost of petroleum. Senate Bills 121, 687, and 1187 would establish a uniform and comprehensive legal regime govern- ing liability and compensation for damages and cleanup costs. Senate Bill 182 would amend the 1972 Ports and Waterways Safety Act and estab- lish comprehensive liability and compensation for damages from oil spills. Senate Bill 898 is titled 'Spill Prevention and Cleanup for Energy Trans- portation Systems Act of 1977'. All testimony given before the committee, and relevant tables, is included. (Goldberg-Florida)
W79-03228

LAW OF THE SEA CONFERENCE STATUS REPORT, SUMME 1978.
Hearing, Committee on International Relations, U.S. House of Representatives, May 24, 1978, 61 p.

Descriptors: *United Nations, *Law of the Sea, *International law, *Conferences, Continental shelf, International waters, Oceans, Economics, Negotiations, Resources development, Research and development, Ownership of beds.

The U.S. House of Representatives' Committee on International Relations held a hearing to receive a status report on the United Nations' Law of the Sea Conference. The Committee's ultimate goal is to negotiate the substance of a treaty establishing the rule of law for the oceans. The principal speak- er was Elliot Richardson, special representative of the President to the Conference. Richardson's report discussed the achievements of a previous Conference session. In the report, seven issues were identified as hardcore and negotiating groups were established to deal with them. These issues included: (1) exploration and exploitation of the seabed; (2) financial arrangements between seabed mining companies and the proposed U.N. Authori- ty that would be created to oversee this developing area of international law and relations; (3) the institutional framework of the Authority; (4) access of landlocked and geographically disadvantaged states to sea resources; (5) sovereign rights of states within their exclusive economic zne; (6) definition

of outer limits of the continental shelf; and (7) delimitation of maritime boundaries. Attention was also given to the problem of maritime pollution. Richardson's verbatim report to the Committee is included as is the U.S. delegation's unclassified report. (Hucks-Florida)
W79-03229

DEEP SEABED MINERALS: RESOURCES, DIPLOMACY, AND STRATEGIC INTEREST.
Prepared by Congressional Research Service, Library of Congress for the Subcomm. on International Organizations, Comm. on International Relations, U.S. House of Representatives, March, 1978, 123 p.

Descriptors: *Mineral industry, *International waters, *Law of the sea, *Mining, Resources, Legislation, United Nations, Nickel, Copper, Cobalt, Manganese, Technical writing.

A study of deep seabed minerals has been prepared by the Congressional Research Service for the use of the U.S. House of Representatives' Committee on International Relations. The study is intended to clarify a number of issues surrounding domestic and international discussion of deep seabed mining and to assist Congress in considering appropriate legislation. The study summarizes the development of the deep seabed mining issue in the United Nations' Third Law of the Sea Conference, the United States Congress, and the business community. THe study also provides an overview of the use, supply, and demand of nickel, copper, cobalt and manganese. Short and long-term trends in supply are discussed, as well as projections for deep seabed mining. A discussion of the possibilities of cartelization is also included, along with the United States' stockpile strategy. The report includes an analysis of the defensibility of seabed mining operations within the context of a changing ocean regime. The final section contains projections of possible mineral recovery and economic benefits of seabed mining. Some perspective on the possible costs and benefits to the United States are set forth. The need for immedicay of the commencement of deep seabed mining is expressed.(Quarles-Florida)
W79-03230

OILSPILL CONTINGENCY PLAN.
Hearings, Subcommittee of Committee on Government Operations, U.S. House of Representatives, Feb. 2 and 3, 1977. 383, 2 app.

Descriptors: *Environment, *Oilspills, *Transportation, *Comprehensive planning, Environmental effects, Oil pollution, Oil industry, Pollutants, Shore protection, Shore birds, Contingency costs, Legislation.

This Housr of Representatives Subcommittee on Environment, Energy and Natural Resources addressed the problem of oilspills as they relate to damage done to the environment. The hearing focused on the nations ability to respond quickly and effectively to an oilspill emergency. Although the 1972 Federal Water Pollution Control Act addresses this problem in a broad sense, the committee recognized the need for a more comprehensive and coordinated oilspill contingency plan aimed at minimizing the environmental damage caused by oilspills. It is United States' dependence on foreign oil which is exacerbating the problem. Due to the ever increasing volume of oil being transported by ocean-going vessels, the probability of massive oilspills increases proportionately. Testifying before the committee were representatives of those federal agencies having major responsibility under the proposed Oilspill Continengency Plan. Agencies represented included: (1) the Environmental Protection Agency; (2) the Center for Law and Social Policy; (3) the National Oceanic and Atmospheric Administration; and (4) the U.S. Coast Guard. All testimony given before the committee, including maps and tables, is included. (Goldberg-Florida)
W79-03231

INDIAN FISHING RIGHTS.
Hearing, Subcommittee on Fisheries and Wildlife Conservation and the Environment, Committee on Merchant Marine and Fisheries, U.S. House of Rep., Jan. 13, 1978, Serial No. 95-27, 325 p, app.

Descriptors: *Indian reservations, *Fishing, *Resource allocation, *Great Lakes, Fisheries, Federal jurisdiction, Lampreys, Michigan, Regulation, Judicial decisions, Resources, Competing uses.

The House of Representatives Subcommittee on Fisheries and Wildlife Conservation and the Environment met to discuss the extent to which the Federal Government may help resolve conflicts between competing users of Great Lakes fishery resources. Parties to the controversy are Indian-American and non-Indian fishermen. Certain court decisions have ordered a share of fishing waters set aside for exclusive Indian use. Further, the Department of Interior has been ordered by the Supreme Court to act in support of Indians in judicial matters, in its capacity as trust agency over Indian affairs. These federal actions have given rise to strong objections by non-Indians who believe they are being discriminated against in the access to the fishery. The Great Lakes have significant commercial, recreational and esthetic vaues. Traditionally, the states surrounding the Great Lakes have had principal responsibility for managing the fishery resource. However, traditional state regulation has come into doubt as applied to Indian-Americans. The Federal Government takes the position that Indian-American fishermen cannot be regulated in the same manner as other recreational and commercial fishermen. Testimony of witnesses from both sides of the controversy is included. (Hucks-Florida)
W79-03232

ARKANSAS RIVERBED RIGHTS OF CHEROKEE, CHOCTOW, AND CHICKOSAW INDIAN NATIONS.
Hearing Select Committee on Indian Affairs, U.S. Senate, May 25, 1977, 242 p.

Descriptors: *Indian reservation, Federal government, *Riverbeds, *Ownership of beds, *Interstate rivers, Oklahoma, Federal government, Legislation, Property values, Arkansas, Appraisals, Water rights.

This hearing before the U.S. Senate Select Committee on Indian Affairs addressed Senate Bill 660. The proposed bill authorizes the Secretary of the Interior to enter into an agreement with the Cherokee, Choctaw and Chickasaw Indian nations providing for the purchase and/or lease by the United States of each nation's rights and interests in the riverbed of the Arkansas River. Through litigation concluded in the Supreme Court, the three Indian nations have recovered from the state of Oklahoma and other trespassing parties, the fee simple title and possession of the Arkansas River riverbed from the confluence of the Grand-Neosho River in Oklahoma to the western boundary of the State of Arkansas. Appraisals of the riverbed property and property rights have been made and accepted. This bill serves to authorize the Secretary of the Interior to begin formal negotiations. All testimony heard before the committee is included, including statements by spokesman of each Indian nation, by the Acting Deputy Commissioner of Indian Affairs for the Department of the Interior, and U.S. Senators Abourezk, Bartlett and Bellman. A copy of the riverbed property and property rights appraisals is also included. (Goldberg-Florida)
W79-03233

PROTECTION AND ENHANCEMENT OF SOIL AND WATER RESOURCES.
Hearings, Subcomm. on Environment, Soil Conservation and Forestry, Comm. on Agriculture, Nutrition, and Forestry, U.S. Senate, August 2 and 4, 1977, 162 p. app.

Descriptors: *Soil conservation, *Water quality, *Erosion, *Agriculture, Water resources, Legislation, Forestry, Rural areas, Administrative agencies, Sediments, Land use, Comprehensive pla
ning.

Hearings before the U.S. Senate's Subcommitt
on Environment, Soil Conservation, and Forest
were held to discuss two pending bills. The fir
Senate Bill 1280, provides for the maintenance
enhancement of the quality of water in rural are
The second, Senate Bill 1616, establishes a natio
policy concerning agricultural, range, and for
land. Senate Bill 1616 also establishes an agricu
tural land review commission to begin a demo
stration program for protecting agricultural, rang
and forest land from being used for nonagricultu
purposes. These two bills address the serious ne
to conserve soil. Reliable sources indicate that
significant portion of our nation's agricultural
source base is being damaged through erosion a
land-use changes. Copies of both of the propos
bills are provided, along with expert testimo
received by the subcommittee. The Soil Conserv
tion Service Administrator testified as to the enc
mous problems of erosion and sedimentation.
spokesman for the National Farm Growers Asso
ation expressed the Association's complete suppo
of the bills, as did a spokesman for the Natio
Farmers Union. Nearly all of the witnesses e
pressed concern over the rapid rate of disappe
ance of agricultural land. All testimony giv
before the Subcommittee is included. (Quarle
Florida)
W79-03234

DEEP SEABED MINING.
Hearings, Subcommittee on Oceanography, Co
mittee on Merchant Marine and Fisheries, U.
House of Representatives, March 17, 18, April
26, 27, May 11, 20, 1977, Serial No. 95-4, 570

Descriptors: *Oceanography, *Mining, *Intern
tional waters, *Law of the Sea, Deep water, Mi
eral industry, Minerology, Oceans, Internation
law, International commissions, Ownership
beds, United Nations.

The formulation of a comprehensive law regul
ing the activities of all nations upon the high s
has been continuing since the 1950s. While Unit
Nations; Law of the Sea Conference sessions ha
made progress in resolving differences relating
fisheries, marine pollution and continental she
matters, it was widely felt that an impasse had be
reached in resolving disputes involving the de
seabed. These House of Representatives Hearin
before the Subcommittee on Merchant Marine a
Fisheries addressed House Bills 3350, 4582, 365
4922, 5624, 6846 and 6784. House Bills 3350 a
4582 are bills to promote the ordinary develo
ment of hard mineral resources in the deep seabe
pending the adoption of an international regi
relating thereto House Bills 3652, 4922, 5624, a
6846 are bills to insure the development of Unit
States ocean mining capabilities and support t
continuation of the Law of the Sea Conferen
negotiations. House Bill 6784 is a bill to encoura
an international regime to govern the use of t
oceans and their resources. All testimony giv
before the committee is included. (Goldberg-Flo
ida)
W79-03235

**FEDERAL WATER POLLUTION CONTRO
ACT AMENDMENTS OF 1977 (FORT CO
LINS, COLORADO).**
Hearing, Subcommittee on Environmental Poll
tion, Committee on Environment and Publ
Works, U.S. Senate, June 13, 1977, Serial No. 9
H25, Part 4, 511 p.

Descriptors: *Federal water pollution control a
*Colorado, *Arid land, *Water resources, Env
ronment, Agriculture, Waste treatment, Dredgin
Municipal wastes, Regulation, Water quality, Pla
ning.

This is a report on hearings of the U.S. Senate
Environmental Pollution Subcommittee held
discuss implementation of and possible amen
ments to the Federal Water Pollution Control A
(FWPCA). This hearing focused on three issues

icular concern to Colorado and the rest of the and semiarid West: (1) the relationship of the n water program to agriculture; (2) the prob- of financing municipal waste treatment plants; (3) the implementation of the '404' dredge-and- program. Witness testimony on the first issue usses: the effectiveness of the law in dealing point sources; and what progress if any has made in abating pollution from nonpoint ces not within the FWPCA regulatory pro- n. Testimony on the second issue relates to the ection of charges to cover operating and main- nce costs of municipal waste water treatment ts, and the impact of delays in federal funding tate and local planning activities. Testimony on third issue relates to the controversy over the PCA's section 404 dredge-and-fill program ch ostensibly arose out of misunderstandings of provision and innacurate publicity. All testimo- s included. (Hucks-Florida)
9-03236

PLEMENTATION OF THE FEDERAL TER POLLUTION CONTROL ACT (REGU- TION AND MONITORING OF TOXIC AND ZARDOUS CHEMICALS).
rings, Subcomm. on Investigation and Review, mmittee on Public Works and Transportation, House of Representatives, July 19, 20, 21, 27, 1977. Serial No. 95-32, 42 p., app.

criptors: *Federal Water Pollution Control , *Sewage treatment, *Ohio River, *Chemical tes, Toxins, Hazards, Chemicals, Monitoring, ulation, Pollutants, Industrial wastes.

ler the auspices of the Federal Water Pollution trol Act (FWPCA), the House Subcommittee investigations and review focused its hearings two water contamination incidents in the Ohio er: spills of carbon tetrachloride; and the dump- of highly toxic hexachorocyclopentadiene EXA) and octachlorocyclopentene (OCTA) in isville, Kentucky sewers. This resulted in the ure of a sewage treatment plant and the direct charge into the river of contaminated raw age. Both incidents temporarily affected down- am communities using the Ohio River as a king water source. The first issue addressed 'Episode Response and Coordination' includ- (1) notification; (2) the state's role; (3) techni- analysis; (4) cleanup assistance; (5) fragmenta- and need for coordination; and (6) environ- ntal law. The second issue was 'Reporting and nitoring' including: (1) monitoring inadequa- ; (2) monitoring needs; and (3) constraints. The d issue was 'Standard Setting and Strategies of ntrol' including: (1) constraints to standard set- ; and (2) strategies for control. The fourth issue 'Alternative Pollution Control Strategies' in- ding: (1) regulation/economic incentives; and health/environmental quality. And the last e discussed was 'Legislative Recommenda- ns'. Included in this document is all testimony rd by the subcommittee. (Goldberg-Florida)
9-03237

ORSE V. OREGON DIVISION OF STATE NDS (AGENCY OVERSTEPPED ITS AU- ORITY WHEN IT PERMITTED A LAND- LL FOR A NON-WATER-RELATED ACTIVI-).
P. 2d 520-28 (Or. Ct. App. 1978).

scriptors: *Oregon, *Landfills, *Administrative cisions, *Estuarine environment, Administrative ncies, Permits, Common law, Public rights, vigable waters, Conservation, Land develop- nt, Airports.

izen petitioners appealed an order of the defend- , Oregon Division of State Lands (DSL). Co- fendant city had applied for a permit to fill 32 es of the Coos Bay Estuary in order to extend airport runway. The DSL issued the permit on condition the city undertake another project to tigate the resultant loss of estuarial resources. tially, this court-sitting as a review court--vacat- the permit, stating that its issuance was incon- tent with the DSL's administrative rule requir- ing that landfill projects be for a water-related activity. In response, the DSL then enacted a temporary rule deleting the 'water-related activity' requirement of the initial rule, and issued a new fill permit after the defendant city renewed its permit application. Again vacating the permit, the court ruled the DSL's deleting the 'water-related activity' requirement from its original rule was inconsistent with the purpose of the applicable state statute and was outside the agency's power to enact. Aside from the statute, the court also ruled the common-law public-trust doctrine required that public use of the lands underlying navigable waters could not be substantially modified except for water-related purposes. (Horwich-Florida)
W79-03238

COOK V. RUPP (STATUTE GIVES OWNERS OF SWAMP-LAND THE RIGHT TO DRAIN AND PROTECT THEIR LAND FOR AGRICULTURAL PURPOSES).
565 S.W. 2d 833-38 (Mo. Ct. App. 1978).

Descriptors: *Missouri, *Land reclamation, *Levee districts, *Flooding, Adjacent landowners, Impaired water use, Drainage effects, Dredging, Ditches, Swamps, Agricultural watersheds.

Plaintiffs, private landowners, sought an injunction to require defendant adjacent landowner to take remedial action to prevent flooding on plaintiff's land. Plaintiff farmed some of his land, which drained over defendant's marshy land. Defendant began to dredge a lake and deposit the mud onto his land to make it suitable for farming. Plaintiff noticed an unusual amount of water accumulating on his property, and attributed this to the defendant's reclamation work. The trial court granted partial relief, and plaintiff appealed. Affirming the lower court, the appeals court ruled there was insufficient evidence to show the need for or value of the relief sought. Plaintiffs had contended defendant's project was a private reclamation which violated the Halls Levee District's reclamation plan and that because defendant had not sought permission from the district's Board of Supervisors, the reclamation project merited condemnation. But the appeals court reasoned that the statute upon which plaintiff relied includes a provision for private drainage rights. The statute gives the owner of any swamp land the right to drain and protect his property for agricultural purposes--as defendant's were--whether the land be within or without any drainage or levee district. (Horwich-Florida)
W79-03239

ELISSON V. EVANS (WATER RIGHTS ARE SUBSTANTIVE RIGHTS AND CANNOT BE ADJUDICATED IN A SUMMARY MANNER).
583 P.2d 398-402 (Mont. 1978).

Descriptors: *Dams, *Water rights, *Montana, *Adjudication procedure, Surface runoff, Appropriation, Irrigation Flow, Erosion, Ditches, Diversion dams, Adjacent land owners.

Plaintiff-landowners brought action to force removal of a dam on neighbor's property to allow water to resume flowing to their land. Defendant had erected the dam to divert water flowing from the land of a third party. Plaintiffs wished to use the water to irrigate their land. After the District Court ruled against plaintiff and adopted defendant's proposed findings of fact and conclusions of law, the plaintiffs appealed. The Montana Supreme Court held that the trial court should have limited its inquiry to appropriateness of plaintiff's request for a temporary injunction, since its inquiry and subsequent decision went beyond those limits, its findings of fact and conclusions of law had to be vacated. The Court stated that water rights, being a substantive property right, cannot be adjudicated in a summary way. Thus the issue of plaintiff's right to the water flow from defendant's land should not have been decided during the preliminary proceedings for injunctive relief. The Court also noted that the plaintiff's bore the burden of proving a valid appropriation of the water in question. The case was remanded to the trial court for further proceedings. (Hucks-Florida)
W79-03240

STATE OF OREGON V. CORVALLIS SAND AND GRAVEL CO. (CHANGE IN LOCATION OF RIVER BED CAUSED BY FLOOD WAS AVULSIVE AND DID NOT RESULT IN CHANGE OF OWNERSHIP OF BED),
582 P. 2d 135264 (Ore. 1978).

Descriptors: *Ownership of beds, *Avulsion, *Oregon, *Channel flow, Navigable rivers, Beds, Navigable waters, Boundaries, Rivers, Alteration of flow, Legal aspects.

The state of Oregon brought ejectment action against an Oregon corporation to determine ownership of the bed of certain navigable portions of the Willamette River, which was not a interstate boundary. The trial court awarded part of the lands to the State and part to the corporation. On remand, the Supreme Court of Oregon held that the State was entitled to possession of the navigable portions of bed which had been, or might be treated as though they had been, bed of the main channel of the river since statehood. This holding was based on the common law rule that states which were admitted to the union on equal footing with original states, acquired title to beds of their navigable waters, except for portions which had passed into private ownership prior to statehood. The Court further held that where rapidly and violently an overflow channel was changed by flood into bed of river itself, the change in location of the river was avulsive and did not result in a change of ownership of bed; thus the corporate owner of land through which one channel at issue was created, owned the bed of river in that particular channel. (Hucks-Florida)
W79-03241

DEPARTMENT OF TRANSPORTATION V. PSC RESOURCES, INC. (PROPERTY OWNER'S STANDING UNDER ENVIRONMENTAL RIGHTS ACT TO ENFORCE WATER QUALITY IMPROVEMENT ACT UPHELD),
387 A. 2d 393-99, 159 N.J. Super. 154 (Super. Ct. Law Div. 1978).

Descriptors: *New Jersey, *Water quality control, *Waste dumps, *Adjudication procedure, Legislation, State jurisdiction, Water pollution, Penalties(Legal), Damages, Legal aspects, Oil wastes, Adjacent land owners.

Plaintiff property owner brought action against defendant corporation claiming that the corporation discharged petroleum products and other material onto the plaintiff's property pursuant to the operation of a waste oil reprocessing and canning facility. The plaintiff sought judgement for damages and to enforce statutory provisions against the discharge of polluting materials. The defendant counterclaimed that the plaintiff had granted leases or licenses for third parties to dump waste upon plaintiff's property...thereby causing accumulated material to be discharged upon defendant's adjacent property, to its damage. The New Jersey Superior Court held that the plaintiff had standing under the state's Environmental Rights Act to enforce the Water Quality Improvement Act, and that the Superior Court had jurisdiction over the action brought under a state statute providing that no person shall deposit or provide storage facilities for human excrement or other pollutant matter such that it gains access to a body of water. Additionally, the court found that the corporation's failure to comply with provisions of the New Jersey Tort Claims act barred its counterclaim. Motions thus disposed of, a trial would be held. (Rule-Florida)
W79-03242

TOWN OF CHINO VALLEY V. STATE LAND DEPARTMENT (1977 AMENDMENTS TO ARIZONA'S GROUNDWATER CODE FOUND CONSTITUTIONAL).
580 P.2d 704-14 (Ariz. 1978).

Descriptors: *Arizona, *Water distribution(Applied), *Groundwater, *Water transfer, Damages, Groundwater resources, Groundwater availability, Water supply, Reasonable use, Beneficial use, Administrative agencies, Competing uses.

Plaintiff, municipal corporation located in Arizona, brought this special action against the State (Arizona) Land Department (SLD), among others, seeking to prevent enforcement of 1977 amendments to the state's Groundwater Code. The amendments set up a system by which persons--who prior to January 1, 1977 had been transferring groundwater from and within a critical groundwater area for a specific reasonable and beneficial use--could continue such actions if they secured a certificate of exemption from the SLD. If the resulting transfer of water injured another's groundwater supply, damages could be recovered but no injunction would issue. Plaintiffs sought to enjoin the SLD from issuing such a certificate to a defendant city. Plaintiffs contended that: (1) the amendments were unconstitutional in that they violated the separation of powers clause in the state constitution; (2) property was being taken without just compensation; and (3) the state legislature had improperly delegated its powers. The Arizona Supreme Court ruled against the plaintiffs, holding that the amendments' statutory limitation of remedy was within the Legislature's power to enact. Furthermore, compensation for property rights is provided for by awarding past, present and future damages. (Quarles-Florida)
W79-03243

ASSOCIATED ENTERPRISES, INC. V. TOLTEC WATERSHED IMPROVEMENT DISTRICT (EXTENSION OF RESERVOIR CONSTRUCTION PERMIT DID NOT IMPAIR VESTED WATER RIGHTS),
578 P. 2d 1359-67 (Wyo. 1978).

Descriptors: *Wyoming, *Water rights, *Reservoir construction, Reservoir sites, Eminent domain, Watershed management, Administrative agencies, Permits, Landowners, Reservoirs.

Appellants, holders of vested senior water rights, appealed an order affirming the decision of the State(Wyoming) Engineer to grant respondent Toltec Watershed Improvement District a time extension to commence and construct the Toltec Reservoir and associated facilities. Appellants, the owner and lessee of the reservoir site, argued: (1) A permit extension would impair their vested senior water rights; (2) The State Engineer's order was arbitrary and capricious because there was no 'good cause' for an extension; (3) the findings of fact contained in the extension order were not supported by substantial evidence. Affirming the extension, the state supreme court denied the first contention because of the state's power of eminent domain for reservoir construction, and because there was no grant of entry onto the land. The court denied appellants' second contention because the delay in construction was due to litigation concerning the validity of the original permit. The court also found substantial evidence to support the Engineer's findings, and thus affirmed the Order. (Horwich-Florida)
W79-03244

STATE EX REL. DEPT. OF TRANSPORTATION V. TURNIDGE (STATE QUIETS TITLE TO ACCRETED LAND).
579 P.2d 284-86 (Or. Ct. App. 1978).

Descriptors: *Oregon, *Accretion(Legal aspects), *Avulsion, *River flow, Drainage patterns(Geologic), Erosion, Floods, Topographic mapping, Maps, Land forming, Rivers.

Plaintiff state of Oregon brought suit to quiet title to a tract of land bordering the Willamette River. The state's claimed the land was accreted to land owned by its predecessor in interest. Defendants, the owners of property lying directly across the river from the disputed parcel, challenged the state's claim. The primary issue was one of fact, specifically, was the disputed parcel of land created by accretion, as claimed by the state, or by avulsion, as claimed by the defendants. Each party produced expert witnesses who testified as to their opinions relative to the movement of the river during the relevant period of time. The evidence was conflicting and contradictory in many areas. Plaintiff's expert witness relied on two official Army engineers; maps to substantiate the state's accretion claim. Defendant's expert based his opinion primarily on a 1913 topographic map to substantiate the avulsion claim. Concurring with the trial judge, the appeals court ruled that the Army engineers' maps--prepared primarily for navigational purposes--were more reliable than the topographic map, and consequently that the disputed parcel was the result of erosion-accretion as claimed by the state. (Horwich-Florida)
W79-03245

PEOPLE EX REL. KUIPER V. WINDEN (ONE WHO ACCEPTS BENEFITS FROM SALE OF WATER RIGHTS IS ESTOPPED FROM LATER CLAIMING THOSE RIGHTS).
580 P.2d 1238-42 (Colo 1978).

Descriptors: *Colorado, *Water rights, *Appropriation, *Irrigation, Tributaries, Wells, Underground streams, Water works, Water supply, River systems, Competing uses.

Defendants, three shareholders in a ditch digging company, appealed from an injunction enjoining them from irrigating certain lands with well water. The company transported water from the Arkansas River to their property for irrigation uses there. The Pueblo (Colorado) Board of Water Works bought the ditch company's water rights, and the state Water Court subsequently entered a decree permitting use changes requested by the Board and the ditch company. The decree also required that lands historically irrigated by water diverted under the initial water rights were to be permanently removed from irrigation by water drawn from the Arkansas River or its underground tributaries. Plaintiffs, the State Engineer and a division engineer, brought the injunction action when they discovered defendants were still using tributary well water for irrigation. The defendants argued they were not parties to the decree proceeding, and therefore were not restricted by its terms. Ruling against the defendants, the state supreme court adopted the trial court reasoning that even if the decree were avoid as to the defendants, one who accepts and retains the benefits of a void judgement cannot later repudiate his action and take advantage of its invalidity. (Horwich-Florida)
W79-03246

FLOODPLAIN MANAGEMENT AND PROTECTION: PROPOSED POLICIES AND PROCEDURES,
Department of Transportation, Washington, DC.
Federal Register, Vol. 43, No. 121, p. 27148-27150, Thursday, June 22, 1978.

Descriptors: *Flood plains, *Wetlands, *Legal aspects, *Federal government, Water policy, Planning, Regulation, Administration, Standards.

The Department of Transportation presents for public comment its proposed policies and procedures on protection and management of floodplains. The proposal implements both Executive Order 11988, Floodplain Management, and the guidelines for implementing the Executive Order issued by the Water Resources Council on January 25, 1978. (Stihler-Mass).
W79-03253

IMPLEMENTATION OF EXECUTIVE ORDER NOS. 11988 AND 11990, FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS,
Tennessee Valley Authority, Washington, DC.
Federal Register, Vol. 43, No. 107, p. 24228-24229, Friday, June 2, 1978.

Descriptors: *Flood plains, *Wetlands, *Legal a
pects, Water policy, Management, Planning, Regu
lation, Tennessee Valley Authority.

The Tennessee Valley Authority proposes to adop
the presented draft procedures to guide the deve
opment, coordination and review of TVA activ
ties. These procedures are intended to implemen
Executive Order Nos. 11988 and 11990, Floodplai
Management and Protection of Wetlands. (Stihle
Mass)
W79-03258

**FLOODPLAINS AND WETLANDS EXECU
TIVE ORDERS: AVAILABILITY FOR PUBLI
COMMENT ON SERVICE PROCEDURES FO
IMPLEMENTATION.**
Fish and Wildlife Service, Washington, DC.
Federal Register, Vol. 43, No. 107, p, 24225-2422
Friday, June 2, 1978.

Descriptors: *Flood plains, *Wetlands, *Federa
government, *Legal aspects, Water policy, Plan
ning, Administration, Protection.

The Fish and Wildlife Service is making availabl
for public review and comment the procedures
will use to implement Executive Order 1198
Floodplain Management, and Executive Orde
11990, Protection of Wetlands. After consideratio
of suggestions from the public and other Govern
ment agencies, the procedures will be finalized
(Stihler-Mass)
W79-03302

FLOODPLAIN MANAGEMENT.
Soil Conservation Service, Washington, DC.
Federal Register, Vol. 43, No. 107, p 24223-2422
Friday, June 2, 1978.

Descriptors: *Flood plains, *Wetlands, *Federa
government, *Legal aspects, Water policy, Admin
istration, Standards, Regulation, Planning, Man
agement, Protection.

These proposed rule changes prescribe the polic
and general guidelines for implementing the spir
and intent of Executive Order (E.O) 11988--Flood
plain Management, in Federal assistance program
administered by the Soil Conservation Servic
(Stihler-Mass)
W79-03352

**THE LEGAL ASPECTS OF POLLUTION -- TH
UK PICTURE WITH E.E.C. COMPLICATIONS**
British Paper and Board Industry Federation
London (England).
J. S. Evans.
In: 115th British Paper and Board Industry Feder
ation Conference on the Use of Technology t
Improve Mill Profitability, March, 1978, Londo
England, Paper No. 14, 6 p.

Descriptors: *Legal aspects, *Water pollution
*Pulp and paper industry, *England, Foreig
countries, Water pollution sources, Legislation
Europe, Effluents, Tidal waters, Coasts, Pipelines
Discharge(Water), Pulp wastes, Persistence, Tox
icity, Absorption.

Implementation of Part II of the Control of Pollu
tion Act (1974) in late 1979 will extend curren
legislative control in the United Kingdom to in
clude nearly all pulp and paper mill discharges
inland and coastal waters. The legislative control
which previously covered only nontidal water
will be extended to cover all discharges throug
pipelines to tidal waters on the sea. A three-par
classificaton scheme has been developed for efflu
ent chemicals according to persistence, toxicity
and bioaccumulation. The United Kingdom gov
ernment remains opposed to attempts by the Euro
pean Economic Community to impose uniform
discharge standards on all similar effluents irre
spective of the geographical location of the di
charger. (Swichtenberg-IPC)
W79-03388

PPLYING THE CLEAN WATER LAW TO OUTHEAST FORESTRY,
il Conservation Service, Atlanta, GA.
r primary bibliographic entry see Field 5G.
79-03413

PRECARIOUS BALANCE UPSET,
r primary bibliographic entry see Field 2A.
79-03432

F. Nonstructural Alternatives

IPACT OF HYDROLOGIC UNCERTAINTIES N FLOOD INSURANCE,
xas Univ. at Austin. Center for Research in ater Resources.
R. Beard.
urnal of the Hydraulics Division, American Soety of Civil Engineers, Vol 104, No HY11, Proedings Paper 14168, p 1473-1484, November 78. 10 tab, 2 ref.

escriptors: *Flood plain insurance, *Insurance, tatistical methods, *Risks, *Flood frequency, ydrology, Flood profiles, Mathematical studies, amages, Flood control, *Uncertainty principle, xpected probability, Actuarial studies.

raditional techniques of flood frequency estimaon produce a bias in estimated frequencies such at, on the average in a great many applications, oods will occur far more frequently than estimat. This is particularly critical in flood insurance udies. It appears to be imperative that the princie of 'expected probability' be used in flood freency studies in order to remove or minimize this as, both for application in actuarial studies and r flood plain zoning. (Singh-ISWS)
79-03053

UNICIPAL WATER CONSERVATION ALERNATIVES,
nnsylvania State Univ., University Park. School Forest Resources.
r primary bibliographic entry see Field 3D.
79-03092

LOODPLAIN MANAGEMENT AND WETAND PROTECTION PROCEDURES INTERM GUIDELINES.
epartment of the Interior, Washington, DC.
r primary bibliographic entry see Field 6G.
79-03101

ATER RESOURCES POLICIES AND AUHORITIES: IMPLEMENTATION OF EXECUIVE ORDER 11988 ON FLOODPLAIN MANGEMENT.
orps of Engineers, Washington, DC.
or primary bibliographic entry see Field 6E.
79-03117

LOOD PLAIN INFORMATION: ALLEGHENY IVER, POTTER COUNTY PENNSYLVANIA.
rmy Engineer District, Pittsburgh, PA.
or primary bibliographic entry see Field 4A.
79-03158

LOOD PLAIN INFORMATION: WHITE IVER, SECOND BRANCH, THIRD BRANCH ND AYERS BROOK, RANDOLPH AND ETHEL, VERMONT.
rmy Engineer District, Waltham, MA.
or primary bibliographic entry see Field 4A.
79-03159

LOOD PLAIN INFORMATION: PASSUMPIC AND MOOSE RIVERS, TOWN OF ST. OHNSBURY, VERMONT.
rmy Engineer District, Waltham, MA.
or primary bibliographic entry see Field 4A.
79-03160

FLOOD PLAIN INFORMATION: WEST BRANCH AND FARMINGTON RIVER, CANTON, NEW HARTFORD, AND BARKHAMSTED, CT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03161

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER AND WHETSTONE BROOK, BRATTLEBORO, VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03162

FLOOD PLAIN INFORMATION: CONNECTICUT RIBER, WEST RIVER, DUMMERSTON, VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03163

FLOODPLAIN AND WETLANDS MANAGEMENT.
National Aeronautics and Space Aministration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03179

FLOODPLAIN MANAGEMENT AND PROTECTION: PROPOSED POLICIES AND PROCEDURES,
Department of Transportation, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03253

IMPLEMENTATION OF EXECUTIVE ORDER NOS. 11988 AND 11990, FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS,
Tennessee Valley Authority, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03258

FLOODPLAINS AND WETLANDS EXECUTIVE ORDERS: AVAILABILITY FOR PUBLIC COMMENT ON SERVICE PROCEDURES FOR IMPLEMENTATION.
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03302

FLOODPLAIN MANAGEMENT.
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03352

6G. Ecologic Impact Of Water Development

EFFECTS OF MOSQUITO CONTROL DITCHING ON JUNCUS MARSHES AND UTILIZATION OF MOSQUITO CONTROL DITCHES BY ESTUARINE FISHES AND INVERTEBRATES,
North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.
For primary bibliographic entry see Field 5G.
W79-03023

FACTORS UTILIZED IN THERMAL POWER PLANT SITING: A REVIEW THROUGH THE MID-19702,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5G.
W79-03035

ENVIRONMENTAL IMPACT STATEMENT PROJECT,
Cornell Univ., Ithaca, NY. Coll of Engineering.
N. Orloff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 737, Price codes: A03 in paper copy, A01 in microfiche. Cornell University Center for Environmental Research. Research Technical Completion Report. December 1978. 34 p, 3 fig, 4 append. OWRT A-056-NY(6). 14-31-0001-5032, 14-34-0001-6033, 7067, 7068.

Descriptors: *Environmental impact statements, *Citizen participation, *National Environmental Policy Act, New York State Environmental Quality Review Act, Government decision-making.

Activities of the Cornell Project on Environmental Impact Statements over the period 1975-1978 are described. The purpose of the Project was twofold: to provide assistance to small communities and citizen groups in their review of environmental impact statements; and to develop general guides for the preparation and review of statements, based on the experience gained in these reviews. The organization and administration of the Project, its policies, the specific statements analyzed, the reports and publications produced, and the formal and informal assistance provided to government officials, are described.
W79-03041

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.
Texas Water Development Board, Austin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 647, Price codes: A11 in paper copy, A01 in microfiche. Texas Department of Water Resources, Austin, 1978. 234 p, 87 fig, 16 tab, 35 ref, 4 append. OWRT C-4137(9024)(1). 14-31-0001-9024.

Descriptors: *Water resources, *Planning, *Estuarine environment, *Environmental effects, Computer models, Systems analysis, Limnology, Oceanography, Ecosystems, Productivity, Evaluation, San Antonio River Basin(Tex), Guadalupe River Basin(Tex), San Antonio Bay(Tex), *Texas.

This research project was designed to provide a set of analytical tools for water resources planners and decision-makers to assist them in measuring and evaluating the effects of water resources development on estuarine environments. The techniques are designed to be sufficiently flexible to analyze all types of water development and management policies. This report describes: (1) the techniques developed to measure the environmental impact of water resources development on estuarine environments, and (2) the application of these techniques to a prototype Texas river basin - estuarine system to demonstrate the approach of the methodology described and its efficacy. The methodology is tested through application to the Guadalupe and San Antonio River Basins and their associated estuary, San Antonio Bay. The capability and limitations of the methodology and the direction future efforts should take are discussed.
W79-03043

UTILITY LINE SITING AND WETLAND PRESERVATION,
Wisconsin Univ. Madison. Land Resources.
For primary bibliographic entry see Field 4C.
W79-03090

FLOODPLAIN MANAGEMENT AND WETLAND PROTECTION PROCEDURES INTERIM GUIDELINES.
Department of the Interior, Washington, DC.
Federal Register, Vol. 43, No. 112, p. 25319-25321, Friday, June 9, 1978.

Descriptors: *Flood plains, *Wetlands, *Federal government, *Legal aspects, Management, Planning, Water policy, Administration, Regulation, Standards, Protection.

Group 6G—Ecologic Impact Of Water Development

This notice provides the Department of the Interior's interim guidelines for complying with Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). (Stihler-Mass)
W79-03101

ENVIRONMENTAL PREFERENCES OF SELECTED FRESHWATER BENTHIC MACROINVERTEBRATES,
Massachusetts Dept. of Environmental Quality Engineering, Westborough. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5A.
W79-03128

ECOLOGY AND ENVIRONMENT IN THE UNITED ARAB EMIRATES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
For primary bibliographic entry see Field 4C.
W79-03137

THE IMPACT OF ENVIRONMENTAL LEGISLATION ON ECONOMIC DEVELOPMENT IN APPALACHIAN NEW YORK.
New York State Dept. of Environmental Conservation, Albany. Office of Program Development and Planning.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 698, Price codes: A08 in paper copy, A01 in microfiche. Sponsored by Appalachian Regional Commission, Washington, D.C. NY-3608-74-I-302-0520. Report ARC 74-219 3608, Jan 1977. 167 p, 30 tab, 4 append. 74-219.

Descriptors: *Resources development, *Environmental effects, *Environmental control, *Water quality management, *Air quality management, *Regional economics, *Economic impacts, *Water pollution control, *Impacts, Air pollution, Water pollution, Water pollution sources, Flood plains, Flooding, Waste disposal, Industrial wastes, Appalachian New York, Environmental protection, Waste loadings, Non-point pollution, Economic development, Industrial development, Industry, Legislation.

The purpose of this report is to provide quantitative and qualitative information on the relationship of environmental programs and economic development for Appalachian New York in order to identify points of conflict between environmental management and economic development objectives as well as complementary conditions where objectives are, or can be, mutually supportive. The main focus is on air and water pollution controls as required under the Clean Air Act Amendments of 1970 and the Federal Water Pollution Control Act Amendments of 1972. A smaller assessment was conducted on the National Flood Insurance Program, Coastal Zone Management Program, and national land use legislation. The study area includes Binghampton, Elmira-Corning, Jamestown, Norwich and Olean, NY. Summary findings and recommendations focus on impacts and conditions that deserve attention from policy-makers at Federal, state and local levels, and highlight where environmental programs have been supportive of economic development objectives and where they impinge on development. Recommendations for action, initiatives and procedures are presented. It was found that the major environmental programs assessed will have only marginal impact on economic development in the area. Costs for manufacturers to comply with existing air and water pollution control programs are listed and are not a factor in decisions on the expansion of existing operations or location of new plants. The limited overall growth envisioned for manufacturing industries is due to the unfavorable competitive forces that have affected the industrial base of most of the northeast states. Extensive tables are presented listing costs of compliance, environmental standards, industrial discharges and levels of pollutants, and location of existing industries. (Coan-NC)
W79-03145

WATER AND SEWER FUNDING PROGRAMS AT FMHA, EDA, AND HUD: A SURVEY OF ENVIRONMENTAL IMPLICATIONS,
National Wildlife Federation, Washington, DC. Resources Defense Div.
For primary bibliographic entry see Field 5G.
W79-03147

ENVIRONMENTAL RESOURCES MANAGEMENT STUDIES OF THE KISSIMMEE RIVER BADSIN,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W79-03150

FLOODPLAIN MANAGEMENT AND WETLANDS PROTECTION.
Small Business Administration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03152

PROTECTION OF WETLANDS.
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03153

ENVIRONMENTAL POLLUTION CONTROL: TWO VIEWS FROM THE GENERAL POPULATION,
Kansas State Univ., Manhattan. Dept. of Political Science.
For primary bibliographic entry see Field 5G.
W79-03154

ENVIRONMENTAL AND ECONOMIC PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE BURNS WATERWAY HARBOR, INDIANA.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03157

CONSIDERATION OF FLOOD PLAINS AND WETLANDS IN DECISIONMAKING.
General Services Administration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03175

FLOODPLAIN AND WETLANDS MANAGEMENT.
National Aeronautics and Space Aministration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03179

THE COMPARATIVE STUDY OF ENVIRONMENTAL POLITICS: FROM GARBAGE TO GOLD,
Uppsala Univ. (Sweden). Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W79-03189

WATER RESOURCES PROJECT TYPE ACTIVITIES: CHANNEL MODIFICATION GUIDELINES.
Fish and Wildlife Service, Washington, DC. and Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03190

COST OF SOCIAL AND ENVIRONMENTAL REGULATIONS IN CONSTRUCTION,
Ohio Northern Univ., Ada.
For primary bibliographic entry see Field 5G.
W79-03191

THE DEVELOPMENT OF REGIONAL IMPACT REVIEW PROCESS AND ITS APPLICATION TO GENERAL DEVELOPMENT CORPORATION'S PORT MALABAR DEVELOPMENT IN PALM BAY AND BREVARD COUNTY, FLORIDA,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W79-03198

FLOODPLAIN MANAGEMENT AND PROTECTION: PROPOSED POLICIES AND PROCEDURES,
Department of Transportation, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03253

IMPLEMENTATION OF EXECUTIVE ORDER NOS. 11988 AND 11990, FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS,
Tennessee Valley Authority, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03258

FLOODPLAINS AND WETLANDS EXECUTIVE ORDERS: AVAILABILITY FOR PUBLIC COMMENT ON SERVICE PROCEDURES FOR IMPLEMENTATION.
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03302

OCS OIL AND GAS: AN ASSESSMENT OF THE DEPARTMENT OF THE INTERIOR ENVIRONMENTAL STUDIES PROGRAM,
National Academy of Sciences-National Research Council Washington, DC. Committee on Natural Resources.
Report to the Department of the Interior, Bureau of Land Management, 1977. 119 p, 4 fig, 4 tab, 44 ref, 3 append. AA550-CT6-30.

Descriptors: *Baseline studies, *Environmental effects, *Oil pollution, *Evaluation, Water pollution effects, REsources development, Programs, *Outer Continental Shelf, Energy sources.

The study examined the concepts, procedures, and results of the Department of Interior Environmental Studies Program in order to provide an evaluation and recommendations that the Department could use as a basis for improvement of the Program. The study focused on the needs, concept, and procedures of the Program and the actual or potential use of the results. It is the Committee's finding that the Program has not been based on an adequate assessment and identification of the scientific research that is required to answer environmental concerns for oil and gas operations. (Sinha-OEIS)
W79-03376

THE SANDS OF WRATH: AMERICA'S DUST BOWL IN RETROSPECT,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 4C.
W79-03434

7. RESOURCES DATA

7B. Data Acquisition

TEMPERATURE MONITORING OF AN INSULATED WATERMAIN,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 8G.
W79-03012

REMOTE SENSING DETECTION OF PERCHED WATER TABLES, A PILOT STUDY,
California Univ., Santa Barbara. Dept. of Geography.

or primary bibliographic entry see Field 4B.
79-03040

EASUREMENT OF OCEAN WAVE HEIGHTS SING THE GEOS 3 ALTIMETER,
ational Oceanic and Atmospheric Administra-n, Boulder, CO. Wave Propagation Lab.
L. Rufenach, and W. R. Alpers.
urnal of Geophysical Research, Vol 83, No C10, 5011-5018, October 20, 1978. 9 fig, 3 tab, 13 ref, 3 pend. NOAA 03-022-35163, NASA 855-33-05--53.

escriptors: *Ocean waves, *Remote sensing, Radar, *Satellites(Artificial), Measurement, Data ocessing, Statistical methods, Statistics, Oceans, orms, Oceanography, Geos 3, Altimeters, Radar timeters, Wave height.

adar altimeter signals transmitted from the low-biting satellite Geos 3 were analyzed for two lected orbits over high seas associated with hur-cane 'Caroline' in the Gulf of Mexico and a orth Atlantic storm. The measured values of gnificant wave height were in reasonable agree-ent with surface measurements, provided that the timeter data were properly edited. The internal nsistency of estimated wave heights for the orth Atlantic storm, a standard deviation of 0.6 or less, and the good agreement with surface ith lend credence to the method. A statistical alysis of the pulse slope variation gave estimated lues of significant wave height within + or -1 m the true values 75% of the time for spatial eraging over 70 km. (Sims-ISWS)
79-03076

OIPS WATER RESOURCES DATA MANAGE-ENT SYSTEM,
ational Aeronautics and Space Administration, reenbelt, MD. Goddard Space Flight Center.
Van Wie.
vailable from the National Technical Information ervice, Springfield, VA 22161 as N78-10542, rice codes: A02 in paper copy, A01 in microfiche. resented at Director's Scientific Seminar, Earth esources Survey: Technology Transfer and ystem Concept Development, February 1977. 17 14 fig. NAS5-22894.

escriptors: *Remote sensing, Hydrology, *River asins, *Hydrologic data, *Information utilization, Landsat satellites, Watersheds, Topographic map-ng, Data collection, Land classification, Maps, limatic data, Watersheds, Water resources man-gement, Data sources, Data management, Bear iver(UT), Utah.

his report presents the text of the Atmospheric nd Oceanographic Information Processing ystem (AOIPS) Water Resources Data Manage-ent System and its computer-generated displays sed to assist hydrologists when analyzing the hysical processes occurring in watersheds. The OIPS is designed to alleviate some of the prob-ms encountered while investigating the complex terrelationships between: Land cover type; to-ography; precipitation; snow melt; surface runoff; vapotranspiration; and streamflow rates. These roblems result from the varying and dissimilar ata types with which researchers must work. hese dissimilar sources include thematic maps, erial photography, and point-source measure-ents, and they differ in spatial resolution, carto-raphic projection, and dimensionality and format. he report lists various data types needed for ydrologic investigations but which can be accom-odated by this Data Management System. The ata types described are Landsat MSS imagery, igital topographic data, SMS VARR imagery and ore traditional basin maps, streamflow and tem-erature records. Examples of accompanying andsat images and descriptions of these images re provided. The Bear River watershed in North-rn Utah, Idaho and Wyoming was selected as a ase study area to demonstrate and test the system. Coan-NC)
V79-03141

PERFORMANCE EVALUATION OF GUILDLINE MODEL 8400 LABORATORY SALINOMETER,
National Oceanographic Instrumentation Center, Washington, DC.
J. E. Boyd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 696, Price Codes: A03 in paper copy, A01 in microfiche. Report No. NOAA-TM-NOS-18, July 1976. 23 p, 6 fig, 3 tab.

Descriptors: *Salinometers, *Salinity, *Laboratory equipment, Saline water, Conductivity, Water sampling, Temperature, Sea water.

Results of a laboratory evaluation of the Guildline Model 8400 Laboratory Salinometer (Autosal) is presented. The salinometer is designed to measure the conductivity ratio of sea water samples with an equivalent accuracy of plus or minus 0.003 part per thousand (ppt) salinity and employ a measurement principal entirely different from that of other available instruments. Testing was performed for overall accuracy, repeatability, and stability of the conductivity ratio measurements as well as the effects of variations in bath temperature, ambient temperature, and power supply voltage and frequency. Test results indicate that the instrument's performance exceeds the published specifications of the manufacturer and more specifically that the conductivity ratio accuracy was better than plus or minus part per million equivalent salinity. Results are presented in detail and graphs and other illustrations are included. (Gibson-IPA).
W79-03270

A HIGH-ACCURACY RECORDING PAN-EVAPORIMETER AND SOME OF ITS POSSIBILITIES,
Institute for Land and Water Management Research, Wageningen (The Netherlands).
For primary bibliographic entry see Field 2D.
W79-03281

AN AUTOMATIC SCANNING RECORDING TENSIOMETER SYSTEM,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2G.
W79-03282

SOIL MOISTURE DETERMINATION USING MICROWAVE RADIATION,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W79-03303

INFLATABLE STRADDLE PACKERS AND ASSOCIATED EQUIPMENT FOR HYDRAULIC FRACTURING AND HYDROLOGIC TESTING,
Geological Survey, Denver, CO. Water Resources Div.
E. Shuter, and R. R. Pemberton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 403, Price codes; A02 in paper copy, A01 in microfiche. Water-Investigations 78-55, July 1978. 16 p, 9 fig, 4 ref.

Descriptors: *Borehole geophysics, *Aquifers, *Hydrogeology, Structural geology, *Aquifer characteristics, Fractures(Geologic), Testing, Methodology, Equipment, Logging(Recording), Planning, Injection wells, Waste disposal wells, Groundwater resources, Transmissivity, *Inflatable packers, *Multiple-aquifer wells.

Independent testing of aquifers is the only way to fully understand the hydrology encountered in boreholes intersecting multiple aquifers. The most feasible method of testing multiple-aquifer wells is through the use of inflatable packers. Straddle packers and associated equipment described are valuable tools for making tests of isolated aquifers as well as conducting hydraulic-fracturing experiments. The system permits multiple tests in a borehole without the necessity of tripping in and out of the hole to redress the packers prior to testing each zone. Electronic pressure transducers, the output of which was fed into strip-chart recorders, were used to monitor the zone being tested, as well as to monitor the zones above and below the packers. This was necessary to ensure that no leaking had occurred around the packers, causing hydraulic continuity between the isolated zones. (Woodard-USGS)
W79-03342

RELATIONSHIP BETWEEN LEAF AREA AND DRY MATTER IN WINTER WHEAT,
Agricultural Research Service, Sidney, MT. Northern Plains Soil and Water Research Center.
J. K. Aase.
Agronomy Journal, Vol. 70, No. 4, p 563-565, July-August, 1978. 3 fig, 14 ref.

Descriptors: *Wheat, Leaves, Plant growth, Growth stages, *Montana, Dry matter.

Models of plant growth and plant water use often require leaf-area measurements, a potentially time-consuming and costly process. The objective of this study was to determine if by establishing a relationship between leaf area and dry matter in winter wheat (Triticum aestivum L. em Thell), that dry matter can be substituted for leaf area. Four cultivars of winter wheat were seeded on Dooley sandy loam and Williams loam (fine-loamy, mixed, Typic Argiborolls) in northeastern Montana in Three divergent growing seasons. Leaf area and dry matter determinations, from random 30-cm row plant samples cut at ground level, were made weekly throughout the season. Leaf area and leaf dry matter were closely correlated (coefficient of determination = 0.951). Leaf area vs. plant dry matter also was closely correlated (coefficient of determination = 0.948) through the fifth growth stage (leaf sheaths strongly erect, tillering complete). Thus it appears that in studies and modeling efforts where leaf area indices are needed, at least for winter wheat, leaf dry matter may be substituted for leaf area index. (Skogerboe-Colorado State)
W79-03427

AN ASSESSMENT OF THE PERFORMANCE OF DIFFERENT BOTTOM SAMPLERS,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5A.
W79-03495

7C. Evaluation, Processing and Publication

DIURNAL VARIATION IN RAINFALL AND CLOUDINESS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W79-03033

PUBLIC GROUNDWATER SUPPLIES IN PULASKI COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-03045

HISTORICAL CLIMATOLOGY,
University of East Anglia, Norwich (England). Climatic Research Unit.
For primary bibliographic entry see Field 2B.
W79-03068

TREE-RING EVIDENCE OF PAST CLIMATIC VARIABILITY,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 2B.
W79-03069

PREDICTABILITY OF CLIMATE,

National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W79-03074

PREDICTING TEMPERATURE TREND IN THE NORTHERN HEMISPHERE TO THE YEAR 2000,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W79-03075

ASPECTS OF PRESENT HYDROLOGICAL AND WATER QUALITY MODELLING,
Karlsruhe Univ. (Germany, F.R.). Inst. fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 6A.
W79-03082

PROCEEDINGS OF A WORKSHOP ON MODELLING OF WATER DEMANDS.
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W79-03083

INTER-DISTRICT WATER ALLOCATIONS VIA LINEAR PROGRAMMING AND LINEAR PROGRAMMING DECOMPOSITION,
Iowa Univ., Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W79-03091

A NONLINEAR PROGRAMMING ALGORITHM FOR REAL-TIME HOURLY RESERVOIR OPERATIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W79-03093

A COMMUNITY SURVEYS ITS SANITATION PROBLEMS,
Bowling Green State Univ., OH. Dept. of Sociology.
For primary bibliographic entry see Field 5G.
W79-03098

ILLINOIS NATURAL HISTORY SURVEY REPORTS OF CLAMS AND DUCKS,
Illinois Natural History Survey, Urbana.
R. E. Sparks.
Report No. 164 February 1977 4 p. OWRT B-097-Ill (5).

Descriptors: Water quality, Clams, Benthic fauna, Benthos, Aquatic life, Aquatic populations, Waterfowl, Aquatic animals, *Ducks, *Illinois, Iowa, *Keokuk Pool(Ill-Iowa).

The Keokuk Pool is a 46-mile section of the Mississippi River backed up behind a dam which extends from Hamilton on the Illinois side to Keokuk on the Iowa side. The Pool hosts the greatest concentration of diving ducks in the Mississippi Flyway during Spring and Fall migrations and has been one of the most productive pools of the Upper Mississippi in terms of game and commercial fishes. The heavy abundance of benthic food organisms, particularly fingernail clams. Recent sampling has shown the fingernail clam populations are only 5-10% of the previous year and their size is smaller. Utilization of the Pool by ducks has declined as a result of the lower fingernail clam population. The low clam populations appear to be related to the flow of the Mississippi River, which means that there is less waste dilution. Specific factors responsible for the decline of the clam population have not been identified. Bioassays are being conducted to determine the fingernail clam's water quality requirements.
W79-03100

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03109

DYNAMICS OF POLYCHLORINATED BIPHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT. PHASE 1, TASK 1, COMPILATION OF INFORMATION,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03118

DYNAMICS OF POLYCHLORINATED BIPHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT PHASE 1, TASK 2: EVALUATION OF COMPILED INFORMATION,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03119

USERS MANUAL FOR LPTOR - A FORTRAN IV LINEAR PROGRAMMING ROUTINE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. Jonch-Clausen, and J. H. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 762, Price codes: A03 in paper copy, A01 in microfiche. Interim Report, May 1976. 39 p, 3 append. OWRT B-115-COLO(2), 14-31-0001-5060.

Descriptors: *Linear programming, Water resources, *Computer programs, *Algorithms, FORTRAN language.

A documentation of the computer algorithm LPTOR for solving linear programming problems is presented. The algorithm, known as the general differential algorithm, is briefly described. A detailed input description for the computer program is given, and the use of the program is illustrated by an example. The mathematical flowchart and program listing are appended. A subroutine, GAUSS, which enables the solution of a system of linear equations, as well as the inversion of a matrix, is documented separately in an appendix.
W79-03123

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W79-03141

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, POTTER COUNTY PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-03158

FLOOD PLAIN INFORMATION: WHITE RIVER, SECOND BRANCH, THIRD BRANCH AND AYERS BROOK, RANDOLPH AND BETHEL, VERMONT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03159

FLOOD PLAIN INFORMATION: PASSUMPSIC AND MOOSE RIVERS, TOWN OF ST. JOHNSBURY, VERMONT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03160

FLOOD PLAIN INFORMATION: WEST BRANCH AND FARMINGTON RIVER, CANTON, NEW HARTFORD, AND BARKHAMSTED, CT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03161

FLOOD PLAIN INFORMATION: CONNECT CUT RIVER, WEST RIVER AND WHETSTO BROOK, BRATTLEBORO, VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03162

FLOOD PLAIN INFORMATION: CONNECT CUT RIBER, WEST RIVER, DUMMERSTO VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03163

DATA-INTENSIVE SPATIAL SAMPLING AN MULTIPLE HIERARCHICAL CLUSTERIN METHODOLOGICAL APPROACH TOWARD COST/TIME EFFICIENCY IN NA URAL RESOURCE ASSESSMENT,
Arizona Univ., Tucson. School of Renewable N ural Resources.
For primary bibliographic entry see Field 6A.
W79-03188

USER'S MANUAL FOR QPTOR - A FORTRA IV QUADRATIC PROGRAMMING ROUTIN
Colorado State Univ., Fort Collins. Dept. of Ci Engineering
T. Jonch-Clausen, and H. J. Morel-Seytoux.
Available from the National Technical Informati Service, Springfield, VA 22161 as PB-291 7 Price codes: A05 in paper copy, A01 in microfic Interim Report, March 1977. 72 p, 3 appe OWRT B-115-COLO(3), 14-31-0001-5060.

Descriptors: *Quadratic programming, Water sources, *Computer programs, Algorithms, FO TRAN language.

A documentation of the computer algorit QPTOR for solving quadratic programming pr lems is presented. The algorithm, known as general differential algorithm, is briefly describ A detailed input description for the computer p gram is given, and the use of the program illustrated by an example. The mathematical flo chart and program listing are appended. A subr tine, GAUSS, which enables the solution o system of linear equations, as well as the inversi of a matrix, is documented separately in an appe dix.
W79-03271

A METHOD FOR THE ANALYSIS OF DRA DOWN FROM MULTIPLE-SOURCE TE PUMPING,
Southern Water Authority, Eastleigh (Englan Directorate of Resource Planning.
For primary bibliographic entry see Field 4B.
W79-03283

EFFECTS OF SIZE AND SHAPE OF A REGIO ON DROUGHT COVERAGE,
Colorado State Univ., Fort Collins. Dept. of Ci Engineering; and Colorado State Univ., Fort C lins. Hydrology and Water Resources Progra
For primary bibliographic entry see Field 2B.
W79-03296

EVALUATION OF THERMOGRAPH DA FOR CALIFORNIA STREAMS,
Geological Survey, Menlo Park, CA. Water R sources Div.
For primary bibliographic entry see Field 2E.
W79-03336

PRINCIPAL USES OF FRESHWATER FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water R sources Div.

G. Phelps.
rida Bureau of Geology, Tallahassee, Map
es No. 83, 1978. 1 sheet, 2 ref.

criptors: *Water utilization, *Freshwater,
ater supply, *Florida, *Maps, Water users, Mu-
pal water, Industrial water, Irrigation water,
rmal powerplants, Domestic water, Water
and.

a result of Florida's rapid and continuing
wth in population and industry, the demand for
er for municipal, industrial, and agricultural
ply has increased. Information about the extent
vailable water resources and the present rate of
sumption are needed for planning and effective
agement of Florida's water resources to meet
er needs of the future. In 1975, the U.S. Geo-
cal Survey and State water management agen-
jointly conducted a detailed inventory of
er use throughout the State to provide a data
to aid in predicting future water needs. This
report portrays some of the information col-
ed, including a generalized display of rates of
er use by the counties of the State and the
cipal purposes for which the water is used.
al water use, in millions of gallons per day, for
uses by counties is shown. (Woodard-USGS)
9-03338

**SOLVED-SOLIDS CONCENTRATIONS OF
TER IN THE SANDSTONE AQUIFER, WIS-
NSIN,**
ological Survey, Madison, WI. Water Re-
rces Div.
W. Devaul.
consin Geological and Natural History Survey
adison), 1975. 1 sheet.

scriptors: *Wisconsin, *Dissolved solids,
roundwater, *Maps, *Water quality, Aquifers,
ter wells, *Sandstone aquifer(Wis).

map, at a scale of 1:100,000, shows the dis-
ed-solids concentration of water in the sand-
ne aquifer, Wisconsin. Natural water quality, as
icated by the total dissolved-mineral matter in
water, is shown for the sandstone aquifer on a
tour map in 100 milligram per liter intervals.
eas with values greater than 600 milligrams a
r are not contoured, but dissolved-solids con-
tration is shown for individual wells yielding
er containing more than 1,000 milligrams per
r total solids. These values are not considered
lly representative and are not used in contour-
. (Woodard-USGS)
9-03341

**OGRAM OBJECTIVES FOR THE NATION-
WATER DATA EXCHANGE (NAWDEX)
R FISCAL YEAR 1979,**
ological Survey, Reston, VA. Water Resources
v.
r primary bibliographic entry see Field 10D.
9-03348

**BAN STORM-WATER-QUALITY DATA,
RTLAND, OREGON, AND VICINITY,**
ological Survey, Portland, OR. Water Re-
rces Div.
L. Miller.
en-file report 78-851, 1978. 23 p, 1 fig, 5 tab, 3
.

scriptors: *Urban runoff, *Storm runoff, *Small
tersheds, *Urban hydrology, *Water quality,
rface runoff, Water analysis, Discharge(Water),
w rates, Rainfall-runoff relationships, Data col-
tions, Hydrologic data, *Portland(Oreg),
ancouver(Wash).

ban storm-water-quality characteristics in the
tropolitan area of Portland, Oreg., and Vancou-
r, Wash., were determined for eight drainage
ins with varying drainage areas, basin slopes,
pervious areas, and land uses. Automatic water-
ality samplers, rain gages, and stream gages
re installed in each basin. Data were collected
determine rainfall intensities and define dis-
charge hydrographs. Data show variation in concentration for about 20 parameters. This report contains data collected between May 1, 1976, and June 3, 1977. (Woodard-USGS)
W79-03349

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1977 WATER YEAR,
Geological Suvrvey, Little Rock, AR. Water Resources Div.
R. K. Knott.
Open-file report 78-824, 1978. 17 p, 2 tab.

Descriptors: *Streamflow, *Flow rates, *Discharge(Water), *Water quality, Stations, *Arkansas, Basic data collections, Water pollution control.

Discharge data were computed for a network of water-quality monitoring stations operated by the Arkansas Department of Pollution Control and Ecology. Some of the sites are located at U.S. Geological Survey or U.S. Army Corps of Engineers daily-discharge stations, but most are at points where discharges are not measured regularly. (Woodard-USGS)
W79-03354

DESCRIPTION OF DATA-COLLECTION SYSTEM AND SYNOPSIS OF SELECTED HYDROLOGIC DATA FOR SOLDIER CREEK BASIN, KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
W. J. Carswell, Jr.
Open-file report 78-678, July 1978. 80 p, 32 fig, 5 tab, 8 ref, 2 append.

Descriptors: *Hydrologic data, *Rainfall, *Surface waters, *Groundwater, *Water quality, Sediment transport, Particle size, Streamflow, Peak discharge, Observation wells, Rainfall disposition, Rainfall-runoff relationships, Data collections, *Kansas, *Soldier Creek basin(Kan).

Soldier Creek basin is a long, narrow basin encompassing an area of about 290 square miles almost directly north of Topeka, Kansas. A wide range of hydrologic data has been collected in the basin since the spring of 1964. These data include rainfall, stream discharge, sediment concentrations, chemical quality of water, and ground-water altitudes. The data collection system consists of 7 recording streamflow stations, 5 recording rainfall stations, 51 nonrecording rainfall stations, and 31 ground-water observation wells. Sediment and chemical quality of water samples were collected intermittently at selected sites. A synopsis of the time and space distribution of rainfall and peak flow are provided in graphic and tabular form for selected events of rainfal and peak flow. Representative data concerning the chemical quality of water and the fluvial sediment also are included. Selected ground-water and seepage-investigation data are depicted graphicaly. (Woodard-USGS)
W79-03355

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1977.
Geological Survey, Salt Lake City, UT. Water Resources Div.
Water-Data Report UT-77-1, September 1978. 548 p, 7 fig.

Descriptors: *Utah, *Hydrologic data, *Surface waters, *Groundwate, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 256 gaging stations; stage and contents for 21 lakes and reservoirs; water quality for 44 hydrologic stations, 161 partial-record stations, and 314 wells; and water levels for 30 observation wells. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Utah. (Woodard-USGS)
W79-03356

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 931, Price codes: A24 in paper copy, A01 in microfiche. Geological Survey Water-Data Report AZ-77-1, September 1978. 550 p, 8 fig.

Descriptors: *Arizona, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Arizona consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of observation wells. This report contains discharge records for 235 gaging stations, 79 crest-stage partial-record stations, and discharge measurements at 26 miscellaneous sites; stage records at 2 gaging stations; stage and contents records for 10 lakes and reservoirs; 15 supplementary records, included with gaging-station records, consisting of month-end or monthly stage, contents, and evaporation of lakes and reservoirs, diversions, and return flows; water-quality records for 67 continuous-record stations, 4 partial-record stations, and 12 miscellaneous sites; and water levels for 83 observation wells. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal and State agencies in Arizona. (Woodard-USGS)
W79-03357

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1977.
Geological Survey, Indianapolis, IN. Water Resources Div.
Water-Data Report IN-77-1, September 1978. 357 p, 4 fig, 22 ref.

Descriptors: *Indiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Indiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 191 gaging stations, stage and contents for 12 lakes and reservoirs, water quality for 31 gaging stations, and water levels for 50 observation wells. Also included are 124 crest-stage partial-record stations and 50 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Indiana. (Woodard-USGS)
W79-03358

HYDROLOGIC AND GEOMORPHIC DATA FROM THE PICEANCE BASIN, COLORADO, 1972-77,
Geological Survey, Denver, CO. Water Resources Div.

D. G. Frickel.
Open-file data report 78-825, August 1978. 169 p, 5 fig, 22 tab, 2 ref.

Descriptors: *Erosion rates, *Precipitation(Atmospheric), *Runoff, *Sediment yield, *Geomorphology, Channel morphology, Slopes, Sediment transport, Aggradation, Degradation(Stream), Hydrologic data, *Colorado, *Piceance basin(Colo), Oil-shale mining effects.

Erosion measurements made during the period 1972-77 in the Piceance basin of northwestern Colorado are presented in tabular form. Most of the measurements consist of repeated surveys of ground-surface altitudes along monumented transects at 45 hillslope sites and 121 channel sites. The sites were generally resurveyed annualy and after significant hydrologic events. Also included are precipitation, runoff, and sediment-yield data for five small plots with different physical characteristics. The data were collected as part of erosion rate, sediment transport, and channel morphology studies being conducted in conjunction with development of the oil-shale resource of the area. The channel measurements were made to determine rates of aggradation, degradation, and lateral movement. The hillslope measurements were obtained to show rates of soil erosion in the area. (Woodard-USGS)
W79-03359

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,
Instituto Venezolano de Investigaciones, Cientificas, Caracas. Lab. de Ingenieria Ambiental.
For primary bibliographic entry see Field 5G.
W79-03425

8. ENGINEERING WORKS

8B. Hydraulics

HYDROLOGY OF SMALL OCEANIC ISLANDS - INFLUENCE OF ATMOSPHERIC PRESSURE ON THE WATER TABLE,
Washington State Univ., Pullman. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W79-03056

WAVE DAMPENING DUE TO RUBBLE-MOUND BREAKWATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. de St. Q. Isaacson.
Journal of the Waterways, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 14178, p 391-405, November 1978. 5 fig, 14 ref, 3 append.

Descriptors: *Waves(Water), *Ocean waves, *Breakwaters, *Coastal engineering, Model studies, Mathematical models, Hydraulic models, Harbors, Structures, Coastal structures, Energy dissipation, Hydrodynamics, Engineering, Hydraulics, Wave dampening, Rubblemound breakwaters.

Laboratory experiments were performed to investigate the attenuation of waves propagating along a straight channel bounded by a pair of parallel rubblemound breakwaters. As a reasonable approximation, the spatial gradient of wave height was found to vary with the square of the height. Experimental data of the corresponding attentuation coefficient as a function of relative depth were presented for breakwater slopes of 1/1.5, 1/2, and 1/3. A simplified analysis was presented, and on the basis of this, the experimental results were reduced in order to provide a simple design procedure for the situation under consideration. (Sims-ISWS)
W79-03059

WAVE FORCES ON PIPELINE BURIED IN PERMEABLE SEABED,
New South Wales Univ., Kensington (Australia). Dept. of Theoretical and Applied Mechanics.
H. MacPherson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 14187, p 407-419, November 1978. 4 fig, 9 ref, 3 append.

Descriptors: *Waves(Water), *Pipelines, *Loads(Forces), *Mathematical models, Model studies, Theoretical analysis, Permeability, Seepage, Pore water, Pressure, Flotation, Coastal engineering, Ocean waves, *Underwater pipelines.

The wave-induced seepage force on buried pipelines was evaluated theoretically. The seepage force was shown to be large enough to warrant inclusion in future engineering design calculations for pipeline stability. The pore-water pressure field at a pipeline buried in a permeable seabed was determined from potential theory, and the pressure at the pipe was integrated to give a net seepage force. This force, of constant magnitude, rotates as the waves pass, thereby tending to force the pipe against the surrounding soil in a cyclic manner. As each wave trough passes over the pipeline, the seepage force acts vertically upwards, and when combined with the total bouyant force it increases the likelihood of pipeline flotation. (Sims-ISWS)
W79-03060

LABORATORY EXPERIMENTS WITH SOLITARY WAVE,
Technion - Israel Inst. of Tech., Haifa. Coastal and Marine Engineering Research Inst.
E. Naheer.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 14189, p 421-436, November 1978. 14 fig, 1 tab, 21 ref, 1 append.

Descriptors: *Waves(Water), *Laboratory tests, *Mathematical models, Model studies, Theoretical analysis, Ocean waves, Celerity, Roughness(Hydraulic), Velocity, Boundary layers, Oceans, Oceanography, Fluid mechanics, *Solitary waves.

Solitary waves were generated in a wave tank by a piston-type wave generator. The measured surface profile, the wave celerity, and the near-bottom fluid particle velocity under the waves were compared to those given by the approximate solutions of Boussinesq, McCowan, and Laitone. It was found that, although Boussinesq's and McCowan's theories are of lower order of approximation than Laitone's theory, they better present the surface profile and the fluid particle velocity of the wave. The wave celerity, on the other hand, was not presented well by McCowan's theory. It also was found that the differences between the theories increase with increasing wave height to water depth ratio. Calculations of the fluid particle velocity near the bottom showed that the three theories differ significantly when used to describe the fluid particle velocity square. It was recommended to generally use Boussinesq's theory as it represents the overall solitary wave better than the other two. (Sims-ISWS)
W79-03061

DIRECT SOLUTION TO PROBLEMS OF OPEN CHANNEL TRANSITIONS,
Roorkee Univ. (India). Dept. of Civil Engineering.
N. Vittal.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14142, p 1485-1494, November 1978. 6 fig, 1 ref.

Descriptors: *Open channel flow, *Aqueducts, *Channels, Open channels, Hydraulics, Equations, Mathematical studies, Beds, Transition flow, *Transition zones, Open channel transitions, Aqueduct transition.

Existing methods of solving problems of open channel transitions involve trial-and-error solution of higher degree equations, and no direct solutions are available in technical literature. This paper presented unique, dimensionless, discharge-depth relationships for exponential, trapezoidal, and circular channels that facilitate direct solutions to various problems on horizontal, vertical, and combined horizontal-vertical transitions even with change in cross-sectional shape. Use of the proposed relationships was demonstrated with practical examples of culvert and aqueduct transitions. (Lee-ISWS)
W79-03286

BOUYANT SURFACE JET IN TIDAL LONGSHORE CURRENT,
New South Wales Univ., Kensington (Australia). School of Mathematics.
E. J. Wolanski, and M. L. Banner.
Journal of the Hydraulics Division, American society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14186, p. 1505-1519, November 1978. 8 fig, 1 tab, 21 ref.

Descriptors: *Model studies, *Buoyancy, *Currents(Water), Coastal engineering, Hydraulics, Hydraulic jump, Hydrodynamics, Jets, Mixing, Numerical analysis, Outfall sewers, Tides, Water pollution, *Tidal currents, Tidal longshore current.

Calculations were presented showing that a three-dimensional buoyant surface jet discharged supercritically into an infinitely large and quiescent body of receiving water transitions to subcritical flow without the occurrence of an internal hydraulic jump. A numerical model also was used to predict the bulk behavior of the jet created by the discharge of a buoyant effluent into a reversng longshore current. It was found that the plume is stretched in the offshore direction, and that the bulk Richardson number attains a local maximum along the plume center line. It was concluded that the presence of the reversing current generally will not inhibit dilution of the plume. However, under certain circumstances, the model predicted a second transition from subcritical back to supercritical flow; laboratory observations suggested that this corresponds to a splitting of the plume into two parts, one actively growing and the other floating passively in the current and later reentrained into the growing plume. (Lee-ISWS)
W79-03288

ON THE NUMERICAL MODELLING OF SHORT WAVES IN SHALLOW WATER,
International Inst. for Hydraulic and Environmental Engineering, Delft (The Netherlands).
M. B. Abbott, H. M. Petersen, and O. Skovgaard.
Journal of Hydraulic Research, Vol. 16, No. 3, p 173-203, 1978. 14 fig, 57 ref, 1 append.

Descriptors: *Ocean waves, *Water circulation, *Bathymetry, *Model studies, Methodology, Simulation analysis, Hydraulics, Computers, Equations, Boundary processes, Momentum equation, *Short waves, *Boussinesq equation, Breaking waves.

A modelling system was developed to generate and to run models of short waves of periodic or irregular form, with any desired physically realistic current field over any given bathymetry. The system-generated models were based upon Boussinesq equations, in which the vertical velocity is supposed to increase linearly from zero at the bed to a maximum magnitude at the surface, in two independent horizontal space variables and time. The Boussinesq equations were formulated as mass and momentum conservation laws. This formulation appeared to provide genuine weak solutions for correctly simulating breaking waves, and thus assured the correct simulation of wave thrusts, or radiation stresses, and associated longshore currents. (Singh-ISWS)
W79-03292

NEW NONLINEAR SHALLOW-FLOW EQUATIONS WITH CURVATURE,
National Aeronautics and Space Administration, Washington, DC.
R. F. Dressler.
Journal of Hydraulic Research, Vol. 16, No. 3, p 205-221, 1978. 5 fig.

Descriptors: *Unsteady flow, *Nonuniform flow, *Boundary processes, *Channel flow, Analytical techniques, Hydrostatic pressure, Flow separation, Hydraulics, Froude number, Mathematics, Equations, *Saint-Venant equations, Shallow-flow equations, Channel curvature, Streamlines.

New equations were derived which are a generalization of the nonlinear shallow-flow partial differential equations, usually called the Saint-Venant equations. These equations posses terms containing the curvature of channel bottom and the derivative of this curvature. Therefore, the resulting streamlines are curved, and the pressure expression contains additional terms to describe the effect of the streamline curvatures. For flat horizontal channels, the equations reduce to the Saint-Venant equations. The equations showed that the velocity is not constant over any cross section orthogonal to a curved bottom. A curve was presented showing that flow separation, defined in terms of the local Froude number, from a curved bottom will occur as a function of channel curvature. The equation can be solved easily by computer for unsteady flows. (Singh-ISWS)
W79-03293

ENERGY FLUX AND WAVE ACTION IN GRAVITY WAVES PROPAGATING ON A CURRENT,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
I. G. Jonsson.
Journal of Hydraulic Research, Vol. 16, No. 3, p 223-234, 1978. 5 fig, 19 ref.

Descriptors: *Waves(Water), *Hydrodynamics, *Energy equation, *Potential flow, Energy, Currents(Water), Momentum equation, Pressure, Velocity, Equations, Dynamic stresses, *Energy flux.

The total energy flux, with the mean energy level as a datum, was shown to be proportional to the wave action flux for waves on steady irrotational currents. This leads directly to the wave action conservation principle. The set-down of the mean water surface was calculated in a new and simple way. In addition, the mean Eulerian current velocity profile was discussed, and the myth of non-zero mass transport in a pure wave motion was reconsidered. Dissipative effects were neglected. (Adams-ISWS)
W79-03294

THE DAMPING OF SOLITARY WAVES,
Coastal and Marine Engineering Research Inst. Haifa (Israel).
E. Naheer.
Journal of Hydraulic Research, Vol. 16, No. 3, p 235-249, 1978. 6 fig, 1 tab, 16 ref.

Descriptors: *Waves(Water), *Boundary layers, *Fluid friction, *Energy dissipation, Fluid mechanics, Reynolds number, Dimensional analysis, Laboratory tests, Analysis, *Boundary roughness, *Wave attenuation, Solitary waves, Wave channels.

The bottom mean resistance coefficient for the flow of solitary waves was derived from considerations of energy dissipation and was obtained from measurements of the attenuation of wave amplitude along a channel. A theoretical expression for the resistance coefficient was developed for the case of laminar flow from the linearized equations of motion and was verified by experiments. Dimensional analysis was used in deriving the empirical relationships which describe the mean resistance coefficient for both laminar and rough turbulent flows. (Adams-ISWS)
W79-03295

LITTORAL DRIFT AND EROSION AT BELLE PASS, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W79-03299

POSITIVE FLOW ESTUARY STRUCTURE,
Poseidon Marketing and Development Co., Arcadia, CA. (Assignee).
R. W. Lundh.
U.S. Patent No. 4,114,381, 8 p, 8 fig, 4 ref: Official Gazette of the United States Patent Office, Vol 974, no 3 p 1198, September 19, 1978.

Descriptors: *Patents, *Barriers, *Estuaries, *Tides, Structures, Inflow, Gates, Saline water intrusion, Saline water barriers, Pollutants.

A barrier device comprising a number of gated structures extending between opposite shores of a tidal estuary provides a means of preventing intrusion of heavier, colder sea water with each incoming tide and to then be the means for ejecting large volumes of collected sea water together with mud, sand and sewage pollutants. The eventual effect will be to create a body of fresh water of previously unattainable purity. This purity is renewable with the discharge of any excess water available. During periods of heavy withdrawal from the upstream pool all gates can be locked closed. After danger of flooding has ended the upstream pool can then store a very large volume of fresh water. Flood water is ejected as fast as it flows into the pool. Tidal power can be used to force flood water into the sea. (Sinha - OEIS)
W79-03318

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,
Rhode Island Univ., Kingston. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-03417

8C. Hydraulic Machinery

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME V. APPENDIX E: PROJECT DESIGNS AND COST ESTIMATES; APPENDIX F: HYDROPOWER.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03168

SITE LIMITATIONS ON SOLAR SEA POER PLANTS,
Carnegie-Mellon Univ/, Pittsburgh, PA.
C. Zener.
Journal of Hydronautics, Vol 11, No 1, p 2-3, January 1977. 1 ref.

Descriptors: *Powerplants, *Energy conversion, Resources development, Water resources, *Sites, Outer Continental Shelf, *Ocean Thermal Energy Conversion(OTEC), *Solar energy.

Successful operation of a Solar Sea Power Plant (SSPP) requires that the warm water intake draws water only from the top mixed layer of the ocean. This requirement places an upper limit Qmax, upon the warm water intake. In this paper, Qmax is calculated as a function of thickness of the upper mixed layer, the ocean current velocity, and the site latitude. Typicaly, this paper limit corresponds to a maximum electrical power output of some thousands of megawatts. (Sinha-OEIS)
W79-03372

SYSTEMS ASPECT OF OCEAN THERMAL ENERGY CONVERSION,
TRW Systems and Energy, Redondo Beach, CA.
R. H. Douglass, Jr, and P. J. Bakstad.
Journal of Hydronautics, Vol 12, No 1, p 18-23, January 1978. 9 fig, 5 tab, 6 ref.

Descriptors: *Powerplants, *Energy conversion, *Resources development, Water resources, *Outer Continental Shelf, *Ocean thermal energy conversion(OTEC), *Solar energy.

Solar energy conversion using an ocean-driven heat engine occupies a special place on the systems engineering horizon. In addition to the concept's proven technical feasibility, conditions in the field of OTEC research are such that systems innovations can be readily and profitably implemented. A team led by TRW Systems Group has synthesized a baseline design for an ocean thermal energy conversion (OTEC) plant of 100-MWe output, with initial cost of $2100/KW delivered at the busbar, a cost that could be reduced considerably through the application of new technology and proposed refinements in baseline subsystems. It has been projected that a per-kilowatt cost of $1100 for a functioning OTEC plant could be realized within the next two decades if a vigorous research and development program is carried out. (Sinha-OEIS)
W79-03375

8D. Soil Mechanics

SOIL EROSION CONTROL ON CONSTRUCTION SITES WITH PORTLAND CEMENT,
Science and Education Administration, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 4D.
W79-03058

8E. Rock Mechanics and Geology

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME IV. APPENDIX C: HYDROLOGY: APPENDIX D: GEOLOGY, SOILS AND MATERIALS.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03167

8F. Concrete

ULTIMATE STRAIN CAPACITY TESTS, CLARENCE CANNON DAM, ST. LOUIS DISTRICT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
J. E. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-029 816, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper C-73-5, March 1973. 53 p, 18 fig, 7 tab, 5 ref, 1 append.

Descriptors: *Concrete testing, *Missouri, *Laboratory tests, *Aggregates, *Strength of materials, Dams, Structures, Hydraulic structures, Concrete, Concrete dams, Petrography, Strength, Stress, Mechanical properties, Testing, Expansion, Thermal expansion, Temperature, Engineering, Civil engineering, *Clarence Cannon Dam(Mo), *Libby Dam(Mo), *Dworshak Dam(Mo), Ultimate strain capacity.

Pertinent physical characteristics, particularly ultimate tensile strain capacity, of 1 simulated interior and 1 exterior concrete mixture containing the coarse aggregate under consideration for use in Clarence Cannon Dam were determined for input to a finite-element computer code for prediction of temperature rise in mass concrete. Results will provide a basis for the establishment of some of the temperature and construction control plans aimed toward minimizing thermal cracking. Generally, the ultimate strain capacity for Clarence Cannon Dam is related more closely to that of Libby Dam, which had a cracking problem, than to that of Dworshak Dam, which had no cracking problem. This is particularly true of the increase in strain capacity, slow versus rapid loading, where the Cannon Dam increase averaged 1.4 times as compared to increases of 1.2 and 2.1 times for Libby and Dworshak Dam, respectively. (Sims-ISWS)

W79-03046

8G. Materials

TEMPERATURE MONITORING OF AN INSULATED WATERMAIN,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
M. B. Fielding.
Report No RP 2044, October 1976. 20 p, 6 fig, 2 tab.

Descriptors: *Pipelines, *Monitoring, *Water temperature, *Soil temperature, *Thermal insulation, Insulation, Soil properties, Thermal properties, Water supply, Polystyrene, Frozen soils, Ontario, Canada.

The use of artificial insulation to provide frost protection for shallow-buried watermains in Ontario, Canada is discussed. A test section of pipe, insulated with an overlying slab of expanded polystyrene, was buried at a minimum depth of 3 ft. 6 in. Three temperature monitoring stations, installed in the test section, consisted of six thermistors located in and around the pipe. Two of these stations were automatically recorded; the other was a manual readout. Four other temperature monitoring stations were installed in non-insulated sections of the pipeline. Monitoring, carried out over 16 months, showed soil temperatures, the relationship of the average air temperature, soil temperature adjacent to the pipe and the temperature of the water in the pipe. It was concluded that freezing and below freezing temperatures occur in soil at depths greater than those previously recognized. Although the flat insulation installed for this study produced measurable differences compared to non-insulated sections, it did not provide significant protection of the watermain against freezing. Flat slab insulation designed and installed to preclude freezing temperatures adjacent to a watermain will also retard heat gain in the soil. A reduction of residence time of the pipe contents within the pipe to less than the time to freeze will keep the pipe contents flowing. It is concluded that technology is adequate for the design of watermains to be protected against freezing. (Davison-IPA)
W79-03012

ULTIMATE STRAIN CAPACITY TESTS, CLARENCE CANNON DAM, ST. LOUIS DISTRICT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8F.
W79-03046

8I. Fisheries Engineering

ENVIRONMENTAL IMPLICATIONS IN THE DESIGN OF COOLING WATER INTAKES,
MacLaren (James F.) Ltd., Willowdale (Ontario).
D. B. Hodgins, P. E. Wisner, and F. E. J. Fry.
Canadian Water Resources Journal, Vol 3, No 3, p 33-48, 1978. 6 fig, 10 ref.

Descriptors: *Powerplants, *Cooling water, *Thermal pollution, *Intakes, Heated water, Water temperature, Thermal powerplants, Effluents, Water pollution sources, Thermal stress, Heat resistance, Engineering, Engineering structures, Nuclear powerplants, Design criteria, Intakes structures, Canada, *Thermal effluent.

One of the most important aspects of using surface waters at power plants relates to the withdrawal or intake of cooling water from the aquatic environment. This paper reviews several Canadian case studies involving environmental improvements at intakes, and outlines the stages in a general environmental approach to intake design. (EIS-Deal)
W79-03466

TWO TYPES OF FISH ATTRACTORS COMPARED IN LAKE TOHOPEKALIGA, FLORIDA,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
R. L. Wilbur.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 689-695, 1978. 6 tab, 11 ref.

Descriptors: *Fish attractants, *Creel census, *Electro-fishing, *Fish behavior, Fish management, Fish harvest, Florida, Attractants, Lakes, Fish populations, Sampling, Bass, Sunfishes, Catfishes, Sport fishing, *Brush attractor, *Block attractor, *Pipe attractor.

Two types of fish attractors, one made from vitrified clay pipes and the other from cement blocks and brush, were investigated in Lake Tohopekaliga, Florida. Electrofishing, creel census, and experimental fishing were used to evaluate the effectiveness of attractors in concentrating fish and enhancing fishing success. Both attractors produced significantly higher fishing success than did control areas and were generally superior to the average fishing success elsewhere in the lake. Brush-block attractors yielded a slightly higher success rate than the pipe attractors. Fishing success at attractor sites was highest during the first year after installation. The lower fishing success in subsequent years appeared to have been at least partially the result of a lake level drawdown which temporarily reduced the standing crop of fish and stimulated expansion of the littoral zone into deeper areas which had been devoid of plants. Soybean mean was found to be a suplemental fish attractant which increased fishing success at attractor sites where catch rates had diminished. (EIS-Deal)
W79-03469

OXYGEN CONSUMPTION OF COHO SALMON IN A PUMPED SALTWATER RACEWAY,
Weyerhauser Co., Seattle, WA.
G. Ferguson, and B. Allee.
In: 26th Annual Northwest Fish Culture Conference, Dec 3-5, 1975, Otter Rock, Oregon, p 135-140. 2 tab, 7 ref.

Descriptors: *Aquiculture, On-site-investigations, Oxygen, *Oxygen demand, *Oxygen requirements, *Coho salmon, Saltwater, *Fish diets, Fish establishment, Fish farming, Fish hatcheries, Fish physiology, Fish stocking, Oxygen consumption.

Oxygen required for salmon production units must be derived from the air. An experiment was conducted to measure the change in oxygen content as water passes through a pumped saltwater raceway that contained coho salmon. It was observed that oxygen consumption rates are generally higher than those rates presented in the literature. (EIS-Katz)
W79-03473

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES SEMINAR SERIES NO. 11, (HAWAII), PAPERS PRESENTED JANUARY 1978 TO JUNE 1978.
Hawaii Univ., Honolulu. Water Resources Research Center.
June 1978. 25 p.

Descriptors: *Organic compounds, *Water reuse, *Gas chromatography, Soil removal, *Flood insurance, Flood control, Manning's equation, Flash floods, Streamflow, Synoptic analysis, *Hawaii, XAD-2 resin, *Mass spectrometry, Lahaina soil, Mililani Sewage Treatment Plant, *Flood Insurance Act, Log Pearson Type III, Bernoulli's theory, Synchronous Meteorological Satellite imagery, Telemetered rain gages.

The Spring 1978 Seminar Series include three papers that present material on (1) the identification of organic compounds in treated effluent for irrigation and the determination of whether such compounds are removed from percolating water by the soil (Green, pp. 1-4); (2) the National Flood Insurance Program, the methods and procedures used to prepare the 100-year flood insurance inundation maps of Hawaii, and the status of the flood maps (Jay, pp. 5-11); and (3) the factors contributing to Hawaiian flash floods, e.g., topography, steep watersheds with narrow basins and low capacities, sufficiently varied synoptic patterns that can cause floods in any month, stream response, and a detection system that depends primarily upon telemetered rain gages and which has no National Weather Service weather radar in Hawaii (Schroeder, pp. 13-25).
W79-03126

WATER RESOURCES SEMINAR SERIES NO. 10 (HAWAII), PAPERS PRESENTED SEPTEMBER 1977 TO DECEMBER 1977.
Hawaii Univ., Honolulu. Water Resources Research Center.
December 1977. 30 p.

Descriptors: Dams, Cofferdams, Water supply, *Rhyolite aggregate, Wind waves, Lake shore erosion, Wind speed, *Riprap particles, Solar radiation, Radiation measurement, *Network sensors, *Hawaii, Aquatic algae, Oysters, Commercial shellfish, Water pollution, Dolosse, High Island, Hong Kong, Carlyle Lake, Rayleigh distribution, Eppley pyranometers, Eppley radiometer, Aquaculture, Biosynthesis, Kaneohe Bay, Kahuku, Ultraviolet filtration.

The Fall 1977 Seminar Series No. 10 includes four papers that cover a range of topics from dams constructed in the sea to exploit the last remaining major catchment in the Kai Kung Peninsula and to provide a freshwater reservoir to serve the Hong Kong area (Watson, pp. 1-8); to a practical design criterion proposed to stabilize lake shores against wind waves and the development of a methodology for estimating the height of wind waves in any lake for a given wind condition (Bhowmik, pp. 9-12); to the augmentation of a network of sunlight observations, begun in the 1930s, with the installation of Eppley pyranometers at 14 new sites on Oahu in 1976 as well as the measurement of diffuse and global radiation at the University of Hawaii Manoa campus, the primary observation site (Ekern, pp. 13-21); and to the establishment, maintenance, and development of a shellfish aquacultural system in Hawaii (Wiebanga, pp. 23-30).
W79-03127

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY OF THE GEOLOGY AND HYDROLOGY OF THE ALBUQUERQUE GREATER URBAN AREA, BERNALILLO AND PARTS OF SANDOVAL, SANTA FE, SOCORRO, TORRANCE, AND VALENCIA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
A. F. Wright.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $1.50. Geological Survey Bulletin 1458, 1978. 31 p, 2 fig, 600 ref.

Descriptors: *Bibliographies, Hydrology, Geology, *Land use, Publications, Urbanization, Water resources, Water utilization, Water quality, *New Mexico, *Albuquerque Greater Urban Area(New Mex), Cities.

This bibliography contains more than 500 references pertaining to geology and hydrology in the Albuquerque Greater Urban Area, N. Mex. Selected citations on land use and related topics also are presented. The area considered extends from Cochiti Dam to Bernardo along the Rio Grande. Each bibliographic reference is listed alphabetica

under the author's last name or the last name of
e first author. Each reference includes the title of
e article or monograph, the publication source,
ar of publication, and page numbers, as well as
ıstrations labeled as figures, where applicable.
Voodard-USGS)
79-03339

**HE NORTH CAROLINA COASTAL ZONE
ND ITS ENVIRONMENT. A COMPILATION
F RESOURCE MATERIALS COVERING THE
OASTAL PLAIN, ESTUARIES, AND OFF-
IORE WATERS, VOLUME I,**
ı Pont de Nemours (E. I.) and Co., Aiken, SC.
vannah River Lab.
I. Du Pont de Nemours and Company Savan-
h River Laboratory Report to U.S. Department
Energy, No. DP-1423, November 1977. 203 p,
W. Dubach, (Compiler). DOE-AT(07-2)1.

escriptors: *North Carolina, *Bibliographies,
Coastal zone, Estuaries, Biology, Engineering,
sh, Fisheries, Geology, Geophysics, *Outer Con-
ental Shelf.

ıe North Carolina coastal zone bibliography has
en assembled in the same format and follows the
ne organizational arrangement as the bibliogra-
ies on South Carolina and Georgia. References
e arranged in ten subject categories according to
e primary information content of each item. De-
riptors which may be used in automating the
llection are supplied for each title. The bibliog-
phy includes references of scientific and techni-
literature dealing with the land area of North
rolina between the Piedmont and the shoreline
d with the offshore water to the continental
pe. Volume 1 contains references to the follow-
subject areas: Biology, Engineering, Fish and
sheries, and Geology and Geophysics. (See also
79-03381). (Sinha-OEIS).
79-03380

**HE NORTH CAROLINA COASTAL ZONE
ND ITS ENVIRONMENT. A COMPILATION
F RESOURCE MATERIALS COVERING THE
OASTAL PLAIN, ESTUARIES, AND OFF-
IORE WATERS. VOLUME II,**
ı Pont de Nemours (E. I.) and Co., Aiken, SC.
vannah River Lab.
W. Dubach.
I. Du Pont de Nemours and Company Savannah
ver Laboratory Report to U.S. Department of
ergy, No. DP-1423, November 1977. 203 p,
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escriptors: *North Carolina, *Bibliographies,
oastal zone, Estuaries, Hydrology, Ground-
ter, Oceanography, Climatology, *Outer Conti-
ntal Shelf.

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ne organizational arrangement as the bibliogra-
ies on South Carolina and Georgia. References
e arranged in ten subject categories according to
e primary information content of each item. De-
riptors which may be used in automating the
llection are supplied for each title. The bibliog-
phy includes references of scientific and techni-
literature dealing with the land area of North
rolina between the Piedmont and the shoreline
d with the offshore water to the continental
pe. Volume 2 contains references to the follow-
subject areas: Hydrology and Groundwater,
eanography; Weather and climate; Miscella-
ous references and references to charts, maps,
d atlases. (See also W79-03380). (Sinha-OEIS)
79-03381

0D. Specialized Information Center Services

**ROGRAM OBJECTIVES FOR THE NATION-
WATER DATA EXCHANGE (NAWDEX)
OR FISCAL YEAR 1979,**
eological Survey, Reston, VA. Water Resources
v.

M. D. Edwards.
Open-file report 78-975, 1978. 7 p.

Descriptors: *Information exchange, *Programs, *Planning, *Scheduling, *Management, Training, Data storage and retrieval, *National Water Data Exchange(NAWDEX), Water data sources.

This report describes the program objectives of the National Water Data Exchange (NAWDEX) for Fiscal Year 1979. These objectives include NAWDEX membership, program administration, management, and coordination, NAWDEX services, identification of sources of water data, indexing of water data, programs and systems documentation, recommended methods for the handling and exchange of water data, training, and technical assistance to NAWDEX members. (Woodard-USGS)
W79-03348

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Changes in Zooplankton Populations in the White Volta with Particular Reference to the Effect of Abate,
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W79-03104 5G

ID MINE WATER
Bacterial Ecology of Strip Mine Areas and its Relationship to the Production of Acidic Mine Drainage,
W79-03104 5G

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W79-03054 5A

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W79-03176 5C

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- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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1 NATURE OF WATER

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VOLUME 12, NUMBER 8
APRIL 15, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 8
APRIL 15, 1979

W79-03501--W79-04000

e Secretary of the U.S. Department of the Interior has de-
rmined that the publication of the periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

ALIPHATIC ACID ANIONS IN OIL-FIELD WATERS--IMPLICATIONS FOR ORIGIN OF NATURAL GAS,
Geological Survey, Menlo Park, CA. Water Resources Div.
W. W. Carothers, and Y. K. Kharaka.
The American Association of Petroleum Geologists Bulletin, Vol. 62, No 12, p 2441-2453, December 1978. 5 fig, 1 tab, 37 ref.

Descriptors: *Organic acids, *Subsurface waters, *Oil fields, *Natural gas, *Chemical reactions, Geology, Temperature, Depth, Chemical analysis, Alkalinity, Ions, Texas, California, *Origin of natural gas, *Formation waters, *Acetate, *Decarboxylation, Proximity indicator, San Joaquin Valley, Brazoria County, Galveston County.

Concentrations of short-chain aliphatic acid anions (acetate, propionate, butyrate, and valerate) in 95 formation-water samples from 15 oil and gas fields in San Joaquin Valley, California, and Houston-Galveston and Corpus Christi areas, Texas, show three temperature regimes. The reservoir rocks consist of marine sandstones ranging in age from Eocene through Miocene. The aliphatic acid anions of formation waters in zone 1 (subsurface temperatures lower than 80 C) are characterized by concentrations less than 60 micrograms per liter and consist predominantly of propionate. The concentrations of aliphatic acid anions in zone 2 (temperatures 80 to 200 C) are much higher (up to 4,865 micrograms per liter) than in zone 1 and decrease with increasing subsurface temperatures and age of their reservoir rocks. Acetate forms more than 90 percent of the total anions. No aliphatic acid anions are believed present in zone 3 where the temperatures are higher than 200 C. Microbiological degradation of acetate and dilution by mixing with meteoric water most likely explain the composition and concentration of aliphatic acid anions in zone 1. The trends in zone 2 and the absence of acid anions in zone 3 are explained by thermal decarboxylation of these acid anions. Aliphatic acid anions generally contribute more than 50 percent and up to 100 percent of the measured alkalinity in the samples of zone 2. Their contributions to the alkalinity in zones 1 and 3 are small. The aliphatic acid anions mainly result from the thermocatalytic degradation of kerogen. (Woodard-USGS)
W79-03558

FRESH GROUNDWATER BENEATH CONTINENTAL SHELF: FINDINGS OF ATLANTIC CONTINENTAL-MARGIN DRILLING PROGRAM,
Geological Survey, Woods Hole, MA. Water Resources Div.
F. A. Kohout, M. H. Bothner, and F. T. Manheim.
American Association of Petroleum Geologists Bulletin, Vol. 61, No. 5, p. 804, May 1977.

Descriptors: *Freshwater, *Groundwater, *Continental shelf, *Atlantic Ocean, *Northeast U.S., *Southeast U.S., Drilling, Test wells, Sampling, Water analysis, Water quality, Salinity, Connate water, Marine geology, *Offshore drilling.

The drilling of 22 test holes on the Atlantic Outer Continental Shelf has for the first time provided a semiquantitative picture of fresh groundwater in offshore areas. Salinity of subseafloor sediments was determined from 175 samples of interstitial water squeezed from sediment cores with a hydraulic press. Data from 5 of the test holes on a transect across the shelf from the New Jersey coast permitted construction of a cross section through the lens of relatively fresh water and the transition zone to seawater. The cross section indicates that low-salinity water (less than 2 parts per thousand) extends more than 16 km offshore and that salinities below 6 parts per thousand extend more than 100 km from shore. (Woodard-USGS)
W79-03562

ORIGIN OF FRESH GROUND WATER BENEATH THE U.S. ATLANTIC CONTINENTAL SHELF,
Geological Survey, Woods Hole, MA. Water Resources Div.
F. A. Kohout, F. T. Manheim, M. H. Bothner, and D. F. Delaney.
Ground Water, Vol 16, No 5, p 360, September-October 1978.

Descriptors: *Freshwater, *Groundwater, *Continental shelf, *Atlantic Ocean, *Northeast U.S., *Southeast U.S., Drilling, Test wells, Water analysis, Reviews, Aquifers, Groundwater movement, Connate water, Salinity, Marine geology, *Offshore drilling.

An understanding of the distribution of fresh ground water and the nature of the transition zone to sea water in aquifers underlying the Continental Shelf is beginning to emerge from pre-water studies. On Long Island and extending south to Florida, recharge is known to pass from surficial deposits into underlying aquifers. Although continous flow systems from mainland to offshore aquifers may exist, calculations by H. R. Henry (1962) suggest that even in the relatively permeable limestones of the Floridan aquifer, adjustment of the salt front to a condition of hydrodynamic equilibrium with the present level of the sea would require in excess of 30,000 years. (Woodard-USGS)
W79-03589

FRESH GROUND WATER FOUND DEEP BENEATH NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Woods Hole, MA. Water Resources Div.; and Geological Survey, Boston, MA. Water Resources Div.
F. A. Kohout, E. H. Walker, M. H. Bothner, and J. C. Hathaway.
Journal of Research of the US Geological Survey, Vol 4, No 5, p 511-515, September-October 1976. 2 fig, 21 ref.

Descriptors: *Freshwater, *Groundwater, *Continental shelf, *Massachusetts, *Islands, Test wells, Deep wells, Aquifers, Connate water, Sampling, Groundwater movement, Water analysis, Water quality, Salinity, Marine geology, Evaluation, *Nantucket Island, Glacial outwash.

In a deep water-resources and stratigraphic test well near the center of Nantucket Island, about 30 miles off the New England coast, freshwater has been found at greater depths than predicted by the Ghyben-Herzberg principle. An uppermost lens of freshwater, which occupies relatively permeable glacial-outwash sand gravel to a depth of 520 feet, is believed to be in hydrodynamic equilibrium with the present level of the sea and the height of the water table. However, two zones of freshwater at 730 to 820 ft and 900 to 930 ft are anomalously deep. Although several explanations are piossible, the most likely is that the entire surface of the Continental Shelf was exposed to recharge by precipitation during long periods of low sea level in Pleistocene time. After the last retreat of glacial ice, seawater rapidly drowned the shelf around Nantucket Island. Since then, about 8,000 years ago, the deep freshwater zones which underlie dense clay layers have not had time to adjust to a new equilibium. Under similar circumstances, freshwater may remain trapped under extensive areas of the Coontinental Shelf wherever clay confining beds have not permitted saltwater to intrude rapidly to new hydrodynamic equilibra positions. (Woodard-USGS)
W79-03690

2. WATER CYCLE

2B. Precipitation

CLIMATE, CLIMATIC CHANGE, AND WATER SUPPLY,
National Research Council, Washington, DC.
Studies in Geophysics. National Academy of Sciences, Washington, D.C., 1977. 132 p, 58 fig, 31 tab, 320 ref. Panel on Water and Climate, National Research Council.

Descriptors: *Water supply, *Climate, *Climatic change, *Socio-economic aspects, *Water resources, *Design, Methodology, Estimating, Forecasting, Water demand, Water shortage, Planning, Effects, Colorado River basin, Southwest U.S., Northeast U.S., Optimization, Mathematical models, Systems analysis, Transfer-function analysis, Bibliographies.

This volume contains essays presented at an American Geophysical Union meeting in Washington, D.C., in April 1976. Evaluated are the interactions between hydrology, water supply, climate, and climatic change. Areas where deficiencies in knowledge and data make rational water resource decision making more difficult than it need be are highlighted. Represented are authors from diverse disciplines, and the subject matter covers a wide-ranging area. The volume is divided into three sections. The first deals with climatology, the second with socio-economic aspects, and the third with water resource design and practice. Considered are: (1) water supply and the future climate; (2) the interpretation of past climatic variability from paleoenvironmental indicators; (3) methods for estimating and projecting water demands; (4) climatic change and water law; (5) identification of economic and societal impacts of water shortages; (6) water resources systems planning; (7) water supply sensitivity of the Northeast to climatic change; and (8) impact on the Colorado River basin and Southwest water supply. Utilized are techniques such as transfer-function analysis, linear programming, and demand estimation. (See W79-03528 and W79-03529) (Bell-Graf--Cornell)
W79-03527

WATER-RESOURCE SYSTEMS PLANNING,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 6B.
W79-03528

METHODS FOR ESTIMATING AND PROJECTING WATER DEMANDS FOR WATER-RESOURCES PLANNING,
California Univ., Riverside.
For primary bibliographic entry see Field 6D.
W79-03529

METEOROLOGICAL ANALYSIS OF AN OAHU FLOOD,
Hawaii Univ., Honolulu. Dept. of Meteorology.
For primary bibliographic entry see Field 2E.
W79-03580

SOME EFFECTS OF SOIL SURFACE COVER ON INFILTRATION,
Auburn Univ., AL.
For primary bibliographic entry see Field 2G.
W79-03676

DERIVATION OF EQUATIONS FOR VARIABLE RAINFALL INFILTRATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W79-03681

CLIMATOLOGICAL AND PHYSICAL CHARACTERISTICS AFFECTING AVIAN POPULATION ESTIMATES IN SOUTHWESTERN RIPARIAN COMMUNITIES USING TRANSECT COUNTS,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
B. W. Anderson, and R. D. Ohmart.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona. USDA Forest Service General Technical Report RM-43, p. 193-200. 2 fig, 6 tab, 2 ref.

Descriptors: *Birds, *Census, Climates, *Methodology, Southwest U.S., Colorado River, Riparian land, Winds, Seasonal, Wetlands, Rivers, Mesquite.

Comparative data from about 20,000 censuses of line transects on the lower Colorado River show that strong winds (20 to 50 kmph) may reduce censusing accuracy but winds below 20 kmph appear not to strongly influence avian estimates. In winter, optimum censusing time is from 1 hour after sunrise to 2.5 hours after sunrise, whereas in summer the optimum period is 0.25 hours before sunrise to 1 hour after sunup. Consecutive censuses from the same area by highly experienced observers (> 5 years of birding) are more consistent than less experienced personnel (10 to 16 months of birding). Each transect should be censused at least twice monthly for minimum best density estimates and three times for maximum best density estimates and three times for minimum best avian species diversity estimates. Four census reveal a greater number of species than with two or three censuses. Number of transects needed for a minimum adequate sample of 3,200 ha of mature honey mesquite (Prosopis juliflora) habitat is four (sampled three times monthly) but for more precise population data for each species six to nine are required. (Stihler-Mass)
W79-03726

DISPLACEMENT OF SOIL WATER BY SIMULATED RAINFALL,
Kentucky Agricultural Experiment Station, Lexington.
For primary bibliographic entry see Field 2G.
W79-03799

NWS'S FLASH FLOOD WARNING AND DISASTER PREPAREDNESS PROGRAMS,
National Weather Service, Silver Spring, MD. Disaster Preparedness Staff
For primary bibliographic entry see Field 6F.
W79-03816

2C. Snow, Ice, and Frost

SOIL - MOISUTRE - TEMPERATURE FOR ALASKAN LOWLAND,
Alaska Univ., Fairbanks
G. L. Guymon
Journal of Irrigation and Drainage Division, ASCE, Vol. 101, No. IR3, p 187-199, September 1975. 5 fig, 13 ref. OWRT C-4049(No 9010)(2).

Descriptors: Soil investigations, *Permafrost, *Alaska, *Soil types, *Frozen soils, *Soil moisture, Soil moisture meters, *Soil temperature, Soil water movement, Soil profiles, Frost, On site investigations, Soil pressure, Pore pressure.

Field work was conducted at four sites in Goldstream Valley north of Fairbanks, Alaska, to obtain soilwater pressure and temperature data from (1) a lowland suprapermafrost soil adjacent to a stream, and (2) a lowland tussock soil underlain by shallow permafrost. Instrumentation at the sites consisted of tensiometer arrays for measuring pore-water pressures in the unsaturated soil zone, thermistor arrays for recording soil temperatures, and probes to determine frost depths. Data analysis shows that the annual soil-moisture and temperature patterns are a complex sequence of events. Soil-moisture-temperature relationships are discussed for summer, winter and spring. It is concluded that moisture movement in soils of extremely cold climates is a complex and dynamic process during the winter freezing period. (Davison-IPA)
W79-03582

PHYSICAL METHODS OF STUDYING ICE AND SNOW,
Army Terrestrial Science Center, Hanover, NH.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 818, Prices codes: A11 in paper copy, A01 in microfiche. CRREL Draft Translation 539, August 1976. 246 p. Translated from Trudy Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institute, Lenigrad (USSR), Vol. 326, 1975. 228 p. V.V. Bogorodskiy, and V.P. Gavrilo, editors.

Descriptors: *Remote sensing, *Ice, *Sea ice, *Snow, Ice cover, Snow cover, Surveys, Instrumentation, Equipment, Radio, Radio waves, Radiation, Acoustics, Sounding, Strength of materials, Structures, Mechanical properties, Physical properties, Cold regions, Cold weather construction, *Conferences, *USSR, Ice breakup.

Proceedings of a scientific symposium organized by the Order of Lenin Arctic and Antarctic Scientific Research Institute and the International Commission for Antarctic Research, Earth Sciences Section, Presidium of the USSR Academy of Sciences, which was held in Leningrad on 1-5 October 1973, were published in this anthology. These articles by Soviet and foreign scientists reflect the results of research conducted in recent years on the following directions: (1) electromagnetic methods for analyzing snow and ice, active and passive radar analysis of ice and snow cover; (2) optical methods for analyzing snow, ice, and water; and (3) dynamic and static methods for analyzing the mechanical properties of ice and snow. (See W79-03597 thru W79-03633) (Sims-ISWS)
W79-03596

RADIOPHYSICAL METHODS FOR ANALYZING ICE AND SNOW,
V. V. Bogorodskiy.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 4-11, August 1976. 2 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Ice cover, *Glaciers, Radio waves, Light, Physical properties, Topography, Topography mapping, Sea ice, Ice, Maps, Glaciology, *USSR, Subglacial relief.

The present state of problems in ice and snow and snow physics that have been solved or are presently being solved by radiophysical methods of analysis was dicussed. Special attention was devoted to research on electromagnetic characteristics of various types of ice and to radio sounding of ice cover, radio thermolocation of ice and snow cover, ice optics, and the mechanical characteristics of ice. Problems pertaining to the stressed state of ice cover, including reseach on glacier movement parameters, were examined. (See also W79-03596) (Sims-ISWS)
W79-03597

FM RADAR SIGNALS REFLECTED FROM ICE SURFACES, AND THE POSSIBILITIES FOR MODELING THEM,
A. B. Babayev, V. P. Logachev, V. N. Parfent'yev, V. A. Fedorov, and G. P. Shelomanova.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 12-16, August 1976. 1 fig, 1 tab, 2ref.

Descriptors: *Remote sensing, *Ice, *Ice cover, *Radio waves, Model studies, Mathematical models, Sea ice, Lake ice, Surface waters, Freshwater, Reflectance, Electrical properties, Engineering, Electrical engineering.

Properties of FM signals reflected from ice surfaces were analyzed on the basis of theoretical and experimental data. The elctrophysical properties of ice and its roughness were taken into account. The possibility of modeling such a signal under laboratory conditions was examined. Possibilities were established for obtaining information on ice thickness using an FM signal. (See also W79-0396) (Sims-ISWS)
W79-03598

EFFECT OF ICE STRUCTURE ON ITS RADIATION CHARACTERISTICS IN THE SHF RANGE,
A. Ye. Basharinov, and A. A. Kurskaya
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 17-19, August 1976. 1 fig, 4 ref.

Descriptors: *Ice, *Remote sensing, *Radio waves, Ice cover, Radiation, Thermal radiation, Microwaves, Model studies, Mathematical models, On-site investigations, On-site data collections, Sea ice, Glaciers, Radiothermal emission.

Observed data were compared with model computations permitting evaluation of the porosity of an ice layer. In relation to the measured spectrums of the emissivity of polar sea ice, the ice porosity was assessed at an air inclusion concentration of 50-100 cu cm. Data from radiation measurements showed that the concentration of air inclusions in young ice does not exceed 5-15kcu cm. The observed abnormalities in the shape of the radiothermal emission spectrum of shelf ice on antarctica, manifesting themselves as a reduction in blackness in the centimeter range, were explained by a model of an ice layer containing water lenses. (See also W79-03596) (Sims-ISWS)
W79-03599

PROPAGATION OF RADIO WAVES IN GLACIERS,
V. V. Bogorodskiy, G. V. Trepov, and B. A. Fedorov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 20-25, August 1976.

Descriptors: *Radio waves, *Radar, *Glaciers, *Remote sensing, Electromagnetic waves, Ice, Ice cover, Model studies, Analytical techniques, Glaciology, Electrical engineering, Polarization.

The components of radar signal attenuation stemming from focusing (defocusing) and depolarization were analyzed. Measurements of the intensity of reflected signals and analyses of fluctuations in their intensity as well as analyses of depolarization phenomena in signals propagating through a glacier were discussed. (See also W79-03596) (Sims-ISWS)
W79-03600

RADIO SOUNDING OF SEA ICE,
V. V. Bogorodskiy, and V. P. Tripol'nikov
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 26-28, August 1976. 1 fig, 4 ref.

Descriptors: *Sea ice, *Sounding, *Radio waves, Laboratory tests, On-site investigations, Electromagnetic waves, Ice, Snow cover, Remote sensing, Physical properties, Ice-water interfaces, Signal velocity, Wave velocity.

Analysis of the electromagnetic characteristics of sea ice in the 40-440 MHz range demonstrated the promise of using this range for radar sounding of sea ice. Representation of the velocity of a radar signal in sea ice is a significant aspect of this problem. It was demonstrated with artificial samples of sea ice that the velocity of electromagnetic waves in sea ice depends on the relative concentration of liquid and solid phases. Analysis of wave velocities in natural sea ice confirms this result. Therefore, when making radar surveys of sea ice thickness, the temperature conditions and classification of ice must be taken into account in parallel. (See also W79-03596) (Sims-ISWS)
W79-03601

EMISSIVITY O ICE, TERRESTRIAL, AND SEA SURFACES MODELED BY STRATIFIED HETEROGENEOUS STRUCTURES.
V. V. Bogorodskiy, A. I. Koslov, and L. T. Tuchkov
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 29-35, August 1976. 2 fig, 14 ref

Descriptors: *Model studies, *Mathematical models, *Radio waves, *Remote sensing, Ice, Oceans, Land, Electromagnetic waves, Radiation, Thermal radiation, Temperature, Radiothermal emission, Polarization, Radiant temperature.

Some electrodynamic models of terrestrial, sea, and ice surfaces were proposed and studied. The models were built by successive introduction of electric and geometric irregularities into a stratified structure, both at the interfaces and within it, leading to formation of models of four classes: (1) with surface electric irregularities; (2) with electric irregularities within the layer; (3) with geometric irregularities at the boundary; and (4) with internal geometric irregularities. Research on the emission characteristics of the examined models was presented to clarify the dependence between their radiant temperature and the electrophysical, geometric, and statistical properties; and recommendations were given on model selection. (See also W79-03596) (Sims-ISWS)
W79-03602

MEASUREMENT OF REFLECTED SIGNALS DURING RADAR SOUNDING IN A LARGE RANGE OF ANGLES,
Z. Klau Dzh.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539. Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 36-41, August 1976. 3 fig, 8 ref.

Descriptors: *Remote sensing, *Radar, *Snow, *Ice, *Antarctic, Radio waves, Reflectance, Sounding, Ice cover, Snow cover, Glaciers, On-site investigations.

This article presented the results of an analysis of ray pattern in research on the nature of echo signal recordings made in a large range of angles. A description was given of three potential sources of error in measuring the reflection velocity of signals. Examples of detailed measurements of reflected signals in a broad range of angles in 1967 at the coast of eastern Antarctica and in 1970 in the vicinity of Byrd Station were presented. (See also W79-03596) (Sims-ISWS)
W79-03603

DEPOLARIZATION OF REFLECTED RADIO SIGNALS,
For primary bibliographic entry see Field 7B.
W79-03604

REMOTE MEASUREMENT OF THE THICKNESS OF SEA ICE BY RADAR METHODS,
For primary bibliographic entry see Field 7B.
W79-03605

ELECTRIC PROPERTIES OF ICE FORMED IN A VACUUM, AND THEIR RELATIONSHIP TO STRUCTURE,
A. K. Zhebrovskiy, G. M. Strakhovskiy, V. N. Nedostayev, and V. I. Stebin.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 52-55. August 1976. 1 fig, 1 ref.

Descriptors: *Ice, *Electrical properties, *Laboratory tests, Crystals, Air pressure, Temperature, Crystal growth, Freezing, Particle size, Measurements, Dielectric permeability.

Experimental results obtained by measuring the dielectric permeability of samples of ice formed in a vacuum chamber were analyzed depending upon structure and vapor pressure (0.0001-0.01 torr) in a frequency range from 0 to 1,000 Hz. The dominant factor in relation to both pure ice and ice formed in a vacuum is the condition under which the ice forms. Ice formed out of the vapor phase consists of polycrystals with a fine-grained structure. Grain size varies within 0.2-0.3 micrometers. The size of the forming grains depends upon the water vapor pressure. As pressure increases, the size of the grains grows. Grain size has a considerable influence on electric properties of ice obtained in a vacuum. Enlargement of grains by about two times causes approximately a 30% increase in dielectric permeability. (See also W79-03596) (Sims-ISWS)
W79-03606

ICE PRESSURE ON SEPARATELY STANDING SUPPORTS IN LABORATORY AND NATURAL TESTS,
S. A. Vershinin, Ye. M. Kopaygorodskiy, V. V. Panov, and Z. I. Shvayshteyn.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 63-68, August 1976. 3 fig, 2 ref.

Descriptors: *Sea ice, *Laboratory tests, *Optical properties, *Salinity, Transmissivity, Light, Ice, Properties, Physical properties, Extinction factor, Transmission factor.

This article presented some results of laboratory and natural tests to determine the action of ice upon vertical supports of hydraulic engineering structures in the presence of moving ice fields. When planning hydraulic engineering structures, the size of the limiting load is taken into account by introduction of coefficient K, which varies (from 1.5 to 7) depending on the geometric parameters of the structure and ice thickness. (See also W79-03596)(Sims-ISWS)
W79-03607

EFFECT OF SEA ICE SALINITY ON OPTICAL EXTINCTION AT WAVELENGTH 6,328 A,
Kh. Devis, and R. M'yunis.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 63-68, August 1976. 3 fig, 2 ref.

Descriptors: *Sea ice, *Laboratory tests, *Optical properties, *Salinity, Transmissivity, Light, Ice, Properties, Physical properties, Extinction factor, Transmission factor.

The results of research on the dependence between the extinction factor and sea ice salinity were presented. Optical extinction factors were computed, and the dependence between the extinction factor and measured ice salinity was set up. An experiment revealed presence of an exponential dependence between the extinction factor and ice salinity. This dependence can be described by the formula $y = 2.41 + 0.001 \exp(1.19x)$, where y is the extinction factor and x is ice salinity. (See also W79-03596)(Sims-ISWS)
W79-03608

OPTICAL CHARACTERISTICS OF SOME VARIETIES OF NATURAL ICE,
B. Ya. Gayskhoki.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 69-72, August 1976. 1 fig, 2 ref.

Descriptors: *Ice, *Optical properties, *Laboratory tests, Sea ice, Light, Energy transfer, Transmissivity, Reflectance, Properties, Physical properties, Transmission factor, Reflection factor, Ice types.

The results of experimental research on optical characteristics of sea and freshwater ice were examined. The diffuse transmission and reflection factors of ice samples were measured in some portions of the spectrum in the 360-1,000 nanometer wavelength range. The relative scattering indicatrix was determined at a wavelength of 6,328 A. The dependence of optical characteristics on the structure and composition of natural ice was examined. (See also W79-03596) (Sims-ISWS)
W79-03609

INSTRUMENTS FOR ANALYZING SPECTRAL REFLECTION OF LIQUID WATER IN THE WAVELENGTH RANGE FROM 1 TO 50 MICRONS,
Vsesoyuznyi Elektrotekhnicheskii Inst., Moscow (USSR). Dept. of the Fundamentals of Electronic Engineering.
For primary bibliographic entry see Field 7B.
W79-03610

THE PROBLEM OF STUDYING CHARGE GENERATION ON THE PHASE INTERFACE OF 0.001 MOLAR SODIUM CHLORIDE SOLUTION UNDERGOING DIRECTED FREEZING,
V. Petera.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 79-87, August 1976. 4 fig, 1 tab, 9 ref.

Descriptors: *Freezing, *Aqueous solutions, *Sodium chloride, Ions, Cations, Water, Ice, Solutes, Electrical properties, Electricity, Interfaces, Ice-water interfaces, Laboratory tests, Electric charge, Electric potential.

It was established through experimental analysis of freezing of NaCl solution that the positive electric potential arising in the solution above growing ice when the base of the vessel is grounded indicates that the quantity of anions in ice exceeds the quantity of cations. Electric equilibrium was attained in this case through compensation of excess chloride ions, as compared to the concentration of sodium ions, by hydrogen ions. The maximum electric potential was observed in the initial phases of directed freezing. (See also W79-03596)(Sims-ISWS)
W79-03611

BEHAVIOR OF ICE IN RAPIDLY VARYING HIGH INTENSITY ELECTROMAGNETIC FIELDS,
L. B. Nekrasov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 88-91, August 1976. 8 ref.

Descriptors: *Ice, *Thim films, *Water, *Electromagnetic waves, Physical properties, Films, Nuclear magnetic resonance, Adsorption, Crystals, Properties, Laboratory tests, Ice properties, Ice behavior, Intense electromagnetic fields.

This work attempted to confirm existence of film water in monolithic poly-crystalline ice on the basis of its behavior in a rapidly varying high intensity electoromagnetic field. Results were presented of experiments with samples of highly and weakly mineralized ice, as well as experiments with ice samples prepared from chemically pure water. It was established that in all cases the ice samples underwent intense breakup in response to a high frequency electric field (field frequency 40.68 MHz). The observed pattern of the breakup of ice practically devoid of impurities was explained. (See also W79-03596) (Sims-ISWS)
W79-03612

MAGNETIC SURVEY OF ICE WEDGES,
B. V. Volod'ko, V. S. Yakupov, E. N. Akhmedeyanov, V. M. Kalinin, and V. O. Papitashvili.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 92-96, August 1976. 1 fig.

Descriptors: *Permafrost, *Ice, *Surveys, *Magnetic studies, Mapping, Locating, Boreholes, Soils, Rocks, Frozen ground, Geology, On-site investigations, Remote sensing, *Ice wedges, Subterranean ice.

The results of a magnetic survey with a spacing of 2 x 2 sq m, performed on a plot on Tyungyulinskaya Terrace, were presented. It was demonstrated that there is no correlation between the pattern anomalies and the distribution of magnetic susceptibility of soil in area. Negative anomalies extend-

ing submeridionally and latitudinally, forming a system of polygons, were revealed clearly in plan-view isolines. Drilling data (29 boreholes) clearly confirmed correspondence of negative magnetic anomalies to ice wedges. (See also W79-03596) (Sims-ISWS)
W79-03613

LOW FREQUENCY POLARIZATION OF ICE IN FROZEN COARSE-DISPERSION FORMATIONS,
V. P. Mel'nikov, and A. M. Snegirev.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 97-101. August 1976. 1 fig, 7 ref.

Descriptors: *Permafrost, *Ice, *Remote sensing, Frozen ground, Electrodes, Electrical resistance, Temperature, Thawing, Rocks, Soils, On-site investigations, Laboratory tests, *Ice wedges, Polarizability, Polarization.

The results of experimental laboratory and field studies on low frequency polarization of ion-conducting rock were discussed. It was demonstrated that polarizability can attain values greater than 20%. Even at a temperature of -14C, such polarization attests to the presence of a phase boundary between ice and nonfreezing water. (See also W79-03596) (Sims-ISWS)
W79-03614

COASTAL ICE DYNAMICS ACCORDING TO SLAR OBSERVATIONS,
For primary bibliographic entry see Field 7B.
W79-03615

SEA SURFACE TEMPERATURE OBSERVATIONS BY A RADIATION THERMOMETER ABOARD AN ICE RECONNAISSANCE AIRCRAFT,
For primary bibliographic entry see Field 7B.
W79-03616

USE OF ACOUSTIC METHODS TO ANALYZE SNOW AND ICE,
For primary bibliographic entry see Field 7B.
W79-03617

ATTENUATION AND SCATTERING OF SOUND WAVES BY SEA ICE,
For primary bibliographic entry see Field 7B.
W79-03618

ONE METHOD FOR MEASURING SOUND ATTENUATION IN NATURAL ICE,
For primary bibliographic entry see Field 7B.
W79-03619

SEISMIC AND TILT METER METHODS FOR ANALYZING ICE COVER,
For primary bibliographic entry see Field 7B.
W79-03620

ANALYSIS OF GLACIER DYNAMICS USING A LASER DEFORMOGRAPH,
I. M. Belousova, I. P. Ivanov, and N. G. Firsov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 140-143, August 1976. 1 fig, 4 ref.

Descriptors: *Glaciers, *Movement, *Remote sensing, *Instrumentation, *Antarctic, Deformation, Equipment, Measurement, On-site investigations, Laboratory tests, Light, Ice, Ice cover, Glaciology, *Lasers, Laser deformographs.

The characteristics of a laser deformograph intended for remote determination of the rate of movement and deformation of glaciers were discussed. The design of the instrument and the optical system, which include a helium-neon laser, a receiving-transmitting telescope, and a high precision triple prism reflector, permitted measurement of deformations of 0.1-1 micron/sec at a range of up to 2 km. Experimental data were presented from measured instantaneous rates of movements of glaciers on Antarctica. (See also W79-03596)(Sims-ISWS)
W79-03621

EXPERIMENTAL STUDY OF ICE ADHESION IN THE LABORATORY AND IN SITU,
V. V. Panov, A. V. Panyushkin, Yu. D. Sinochkin, and Z. I. Shvayshteyn.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 144-152, August 1976. 2 fig, 1 tab.

Descriptors: *Ice, *Mechanical properties, *Instrumentation, *Laboratory tests, On-site investigations, Loads(Forces), Physical properties, Artificial substrates, Surfaces, Salinity, Temperature, *Ice adhesion, Free surface energy.

This article examined original instruments and a procedure for determining adhesion of ice to construction materials and coatings in laboratory and field conditions. Also discussed were the results of experiments in which the effect of various factors on adhesion was studied. Semi-empirical relationships were obtained for computation of adhesive force and consideration of the effect of temperature and salinity on this variable. (See also W79-03596)(Sims-ISWS)
W79-03622

ANALYSIS OF THE ICE LAYER BREAKDOWN PROCESS,
N. A. Grubnik, V. I. Fomin, and A. B. Shemyakin.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 153-154, August 1976. 1 fig.

Descriptors: *Ice, *Mechanical properties, *Laboratory tests, Physical properties, Tensile strength, Elasticity(Mechanical), Flexibility, Vibrations, Strength, Stress, Strength of materials, Ice breakdown, Metallic surfaces, Modulus of elasticity, Breakdown processes.

The modulus of elasticity of ice on a metallic surface was determined by the resonant method of flexural oscillations. Breakup of ice in response to longitudinal oscillations of a metallic rod with ice frozen onto it and in response to flexural oscillations of a plate bearing ice was described. A dependence was revealed between the amplitude of plate sag at which ice begins to break up and various factors. (See also W79-03596)(Sims-ISWS)
W79-03623

MECHANICAL PROPERTIES OF SNOW AS A CONSTRUCTION MATERIAL,
For primary bibliographic entry see Field 8G.
W79-03624

ARCTIC SNOW COVER,
I. M. Dolgin, N. N. Bryazgin, and L. S. Petrov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 163-168, August 1976. 2 fig, 2 tab, 5 ref.

Descriptors: *Snow cover, *Arctic, *Mapping, *Variability, Depth, Density, Snowfall, Snow, Storms, Albedo, Thawing, Melting, Seasonal, Climatology.

Maps of maximum height and persistence of snow cover and of the times of snow formation and disintegration were plotted on the basis of arctic snow cover research performed by the AANII. Great variability of the height of snow cover and its other characteristics was established. (See also W79-03596)(Sims-ISWS)
W79-03625

A METHOD FOR MEASURING HIGH MOISTURE RESERVES IN SNOW COVER USING COSMIC RADIATION,
For primary bibliographic entry see Field 7B.
W79-03626

METHODS FOR MEASURING THE STRENGTH CHARACTERISTICS OF NATURAL AND PROCESSED SNOW,
For primary bibliographic entry see Field 8G.
W79-03627

STATISTICAL EVALUATION OF THE SPATIAL DISTRIBUTION OF THE PRINCIPAL ICE COVER PARAMETERS,
A. Ya. Buzuyev.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 185-190, August 1976. 2 fig, 8 ref.

Descriptors: *Ice, *Ice cover, *Spatial distribution, *Statistics, Measurement, Data processing, Snow, Snow cover, Glaciers, Glaciology, *Ice thicknesses

Correlation functions for distribution of thicknesses of ice of different ages were obtained through statistical treatment of measurements; it was demonstrated that the distribution of thicknesses of ice and heights of snow was described satisfactorily by a (Sharl'ye) function. (See also W79-03596)(SIms-ISWS)
W79-03628

ANALYSIS OF THE MECHANICAL PROPERTIES OF FRESHWATER ICE IN THE PRESENCE OF SLOW LOAD CHANGES,
K. N. Korzhavin, and A. B. Ivchenko.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 191-195, August 1976. 1 fig, 10 ref.

Descriptors: *Ice, *Lake ice, *Mechanical properties, *Model studies, Mathematical models, Theoretical analysis, Loads(Forces), Ice loads, Stress, Deformation, Strength, Temperature, Analytical techniques, Rheology, Freshwater ice.

A rheological model describing behavior of ice under a load was selected on the basis of experimental data on the correlation between ice deformation and stress in combination with information on the structure of polycrystalline ice. A rheological equation describing changes in shape in the presence of nonlinear correlation between deformation and stresses for most elements composing the model was obtained for the proposed model. The problem of the stressed state of ice cover in response to temperature change was solved theoretically. The rheological model can be used to solve various problems. The possibility for improving the model as data on structure of ice and its behavior under a load are accumulated is important. (See also W79-03596)(Sims-ISWS)
W79-03629

SHORT-TERM ICE CREEP AND MICRO CRACK FORMATION KINETICS,
Yu. K. Zaretskiy, A. M. Fish, V. P. Gavrilo, and A. V. Gusev.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 196-203, August 1976. 4 fig, 4 ref.

Descriptors: *Ice, *Mechanical properties, *Creep, *Cracks, Stress, Loads(Forces), Ice loads, Deformation, Compressive strength, Acoustic, Elasticity(Mechanical), Model studies, Laboratory tests, Mathematical models, Kinetics, Rheology, Ice breakup

The results of research on short-term creep of freshwater ice samples subjected to single-axis compression were presented. Acoustic emission accompanying deformation of ice under stre

were recorded in experiments. This permitted the authors to reveal the micromechanism behind short-term creep, to provide a physical interpretation of the limit of long-term strength, and to establish the criteria of ice breakup. The fundamental possibility of determining rheological properties of ice from acoustic emission data was demonstrated. (See also W79-03596)(Sims-ISWS)
W79-03630

FIELD ANALYSES OF PHYSIOCOMECHANICAL PROPERTIES OF ICE COVER,
A. Ya. Ryvlin.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 204-209, August 1976. 2 fig, 2 tab.

Descriptors: *Ice cover, *Mechanical properties, *Strength, Ice, Ice loads, Loads(Forces), Lake ice, Temperature, Salinity, Friction, Fluid friction, Roughness(Hydraulic), Physical properties, Yield strength, Data processing, Freshwater ice, Ice breakup.

This article generalized the results of experimental research on the limit of ice cover flexural strength and external ice friction, performed for a number of years on arctic seas and other freezing water basins in the country. Generalized data were presented on the magnitude of constants characterizing these physiocomechanical properties of ice. Empirical computation formulas that can be used in practice to determine the limit of ice cover flexural strength were presented. (See also W79-03596)(Sims-ISWS)
W79-03631

DETERMINATION OF SPECIFIC BREAKUP ENERGY AND CONTACT PRESSURES PRODUCED BY THE IMPACT OF A SOLID AGAINST ICE,
D. Ye. Kheysin, V. A. Likhomanov, and V. A. Kurdyumov
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 210-219, August 1976. 3 fig, 6 ref.

Descriptors: *Ice, *Strength, *Mechanical properties, *On-site investigations, Energy, Data processing, Mathematical models, Equations, Loads(Forces), Ice loads, Velocity, Pressure, Elasticity)Mechanical), Physical properties, Strength of materials, Contact pressures, Impact(Mechanical), Ice breakup, Breakup energy.

Penetration of a solid into an ice surface upon impact was examined. A mathematical model of the penetration process was built on the basis of data from special experiments. This model was used to determine contact pressures in the zone of impact. Maximum contact pressures averaged over the area of the zone of contact turned out to be directly proportional to the unit fractionation energy of ice, which was known from experiments. (See also W79-03596)(Sims-ISWS)
W79-03632

A RADIO HYDROACOUSTIC METHOD FOR ANALYZING MODERATE-RANGE CHARACTERISTICS OF SEA ICE DYNAMICS,
For primary bibliographic entry see Field 7B.
W79-03633

EARLY DEGLACIATION OF THE LABRADOR SHELF,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Geoscience Center.
G. Vilks, and P. J. Mudie.
Science, Vol 202, No 4373, p 1181-1183, December 15, 1978. 2 fig, 1 tab, 24 ref.

Descriptors: *Paleoclimatology, *Glaciers, *Continental shelf, *Atlantic Ocean, Coasts, Sediments, Bottom sediments, Cores, Core logging, Pollen, Core drilling, Subarctic, Cold regions, Glaciology, *Labrador shelf, Deglaciation.

Two marine sediment cores from a basin on the southeastern Labrador Shelf penetrated a mud sequence extending back to 21,000 carbon-14 years before the present (B.P.). The benthic foraminifera were dominated by subarctic nearshore species indicative of ice-free summer waters. The pollen record indicated the presence of a sedge-shrub tundra in eastern Labrador as early as 21,000 years B.P. Both sources of evidence suggested less extensive continental ice than has been reported previously for this subarctic region. (Sims-ISWS)
W79-03814

DYNAMICS OF AN ICE COVERED LAKE WITH THROUGH-FLOW,
Goteborg Univ. (Sweden). Dept. of Oceanography.
For primary bibliographic entry see Field 2H.
W79-03898

2D. Evaporation and Transpiration

ESTIMATING GROUNDWATER RECHARGE FROM CONSERVATION BENCH TERRACES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W79-03692

ACTUAL EVAPOTRANSPIRATION OVER A SUMMER PERIOD IN THE 'HUPSEL CATCHMENT',
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydraulics and Catchment Hydrology.
H. Stricker, and W. Brutsaert.
Journal of Hydrology, Vol. 39, No. 1/2, p 139-157, October 1978. 7 fig, 6 tab, 13 ref.

Descriptors: *Evapotranspiration, *On-site investigations, *Model studies, Mathematical models, Temperature, Air temperature, Winds, Radiation, Humidity, Rainfall, Evaporation, Energy budget, Measurement, Vegetation, Land use, Agriculture, Watersheds(Basins), Heat transfer, *Netherlands.

Actual evapotranspiration was determined in a rural catchment, 'Hupselse Beek', situated in a sandy region in the eastern part of the province of Gelderland, in The Netherlands; the experiment covered a period of nearly 80 days in the summer of 1976, during which a severe drought was experienced in western Europe. Actual evapotranspiration was obtained indirectly by the energy budget on an hourly basis, in which the sensible heat flux was calculated from the mean temperature profile and the wind speed. The sensitivity of the results was analyzed for the choice of the roughness and the zero-plane displacement height in the wind profile, and for errors in the measured temperatures. The calculated results were quite insensitive to the exact formulation of the Monin-Obukhov functions for the mean wind and temperature profiles. However, it was found that the effect of non-neutral atmospheric conditions cannot be neglected; the effect of the buoyancy due to water-vapor stratification on the overall stability of the atmosphere was also noticeable. A comparison with a measure of potential evapotranspiration showed that the actual evapotranspiration was far from the potential. (Sims-ISWS)
W79-03813

RADIATION AND ENERGY BALANCE OF A TRICKLE-IRRIGATED LEMON GROVE,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3F.
W79-03828

EVAPORATION OF WATER FROM SAND, 6. THE INFLUENCE OF THE WATER TABLE ON DIURNAL VARIATIONS,
National Inst. for Water Research, Windhoek (South West Africa).
D. H. R. Hellwig.
Journal of Hydrology, Vol 39, No 1/2, p 129-138, October 1978. 6 fig, 3 tab, 2 ref.

Descriptors: *Evaporation, *Sands, *Water table, Diurnal distribution, Arid climates, Arid lands, Radiation, Condensation, Lysimeters, Temperature, Variability, Vapor pressure, *Sand tanks, *Diurnal evaluation, Diurnal variation, Diurnal peak, Condensation surface, Evaporation tanks, Vapor pressure deficit.

Evaporation from sand tanks in an arid climate was estimated by measuring the amount of water needed to maintain the water table at a prescribed, fixed level. In earlier experiments, two peaks were found, one in the afternoon and the other at sunrise. To obtain more reliable information on the phenomenon of the peak at sunrise, hourly data were evaluated from an evaporation experiment which lasted 847 days. The results of 518 days were used for a diurnal evaluation. It was confirmed that two peaks occurred during a 24-hour period. One peak was related to radiation, and the deeper the water table was kept below the sand surface, the later the peak occurred. This was the absolute diurnal peak for those tanks in which the sand surface was never dry. It was a relative diurnal peak for those tanks in which the sand surface was normally dry. The other peak appeared at sunrise and was related to the air temperature. This peak was independent of the depth of the water table up to a depth of 400 mm below the sand surface. Down to a water table of 600 mm below the sand surface, the time lag at which this peak occurred relative to the lowest air temperature increased for up to 2 hours. This peak was a relative diurnal peak for those tanks in which the sand surface was never dry. It was the absolute diurnal peak for those tanks in which the sand surface was normally dry. It appeared as if the evaporation peak at sunrise depended on the presence of a condensation surface. (See also W74-11267, W74-11266, W74-07169, W73-07056 and W73-07055) (Roberts-ISWS)
W79-03960

2E. Streamflow and Runoff

SIMULATION PROCEDURES FOR BOX-JENKINS MODELS,
University of Western Ontario, London.
A. I. McLeod, and K. W. Hipel.
Water Resources Research, Vol 14, No 5, p 969-975, October 1978. 2 tab, 35 ref.

Descriptors: *Simulation analysis, *Synthetic hydrology, *Reservoir design, *Model studies, *Algorithms, *Parametric uncertainty, *Box-Jenkins model, Stochastic processes, Computer models, Computer programs, Equations, Hydrologic data, Systems analysis.

New simulation procedures are presented for generating synthetic data from either a nonseasonal or a seasonal Box-Jenkins model. The simulation techniques are designed so that random realizations of the underlying stochastic process are employed for starting values. Becaused fixed beginning values are not utilized, systematic bias is not introduced into the synthetic trace. When the data have been transformed by a Box-Cox transformation, the inverse transformation can be conveniently incorporated into the simulation process. Also, a new algorithm is presented for simulating integrated models. A method is developed for incorporating parameter uncertainty into simulation studies, and it is explained how this technique can be used in the design of reservoirs. Practical applications are presented to demonstrate the efficacy of the aforesaid simulation methods. In addition, the Fortran computer subroutines for the simulation procedures are included in an appendix with the microfiche edition of this paper. (Bell-Cornell)
W79-03523

METEOROLOGICAL ANALYSIS OF AN OAHU FLOOD,
Hawaii Univ., Honolulu. Dept. of Meteorology.
T. A. Schroeder.
Monthly Weather Review, Vol. 105, No. 4, p 458-

468, April 1977. 14 fig, 2 tab, 10 ref. OWRT A-062-HI(2).

Descriptors: *Flood data, *Oahu, *Thunderstorms, *Synoptic analysis, Weather data, Rain, Weather patterns, Rainfall intensity, Rainfall-runoff relationships, Instrumentation, Rain gages, Networks, Stream gages, Hawaii.

Results of a detailed study of the severe rainstorm on the island of Oahu, Hawaii, on April 19, 1974 are reported. Weather conditions leading to flood conditions in Hawaii have been classified as: (1) upper tropospheric troughs which overlie surface trade winds in any season; (2) cold fronts penetrating Hawaii from midlatitudes; (3) Kona lows developing west of the islands during the winter; and (4) tropical cyclones. The storm under study resulted from the first condition. Examinations of the extensive rain gage system on Oahu were made to determine the mesoscale structures of the precipitating cloud systems. From a study of special rain and stream gage network in Moanalua Valley it was concluded that the existing Hawaiian flood detection system is inadequate. Information obtained from the rain gages was incorporated with available meteorological observations, and a conceptual model of the flood producing system for this storm was constructed. It was concluded that the mountainous terrain of the area is a major element in the persistance of thunderstorm activity (Davison-IPA)
W79-03580

2F. Groundwater

FRESH GROUNDWATER BENEATH CONTINENTAL SHELF: FINDINGS OF ATLANTIC CONTINENTAL-MARGIN DRILLING PROGRAM,
Geological Survey, Woods Hole, MA. Water Resources Div.
For primary bibliographic entry see Field 1A.
W79-03562

NOTES ON A SERIES REPRESENTATION OF THE LEAKY AQUIFER WELL FUNCTION,
Nevada Univ. System, Las Vegas. Water Resources Center.
C. M. Case, and J. C. Addiego.
Journal of Hydrology, Vol. 32, p 393-397, 1977. 5 ref. OWRT A-059-NEV(4).

Descriptors: *Aquifers, *Wells, *Mathematical studies, Equations, *Leaky aquifers.

A simple series representation of the leaky aquifer well function is presented. Fairly rapid computations of W(u, r/L) to a high precision for a wide range of values of u and r/L. Representative values of W(u, r/L) computed using 20 terms of the series of eq. 9 are tabulated. (Davison-IPA)
W79-03588

ORIGIN OF FRESH GROUND WATER BENEATH THE U.S. ATLANTIC CONTINENTAL SHELF,
Geological Survey, Woods Hole, MA. Water Resources Div.
For primary bibliographic entry see Field 1A.
W79-03589

RECHARGE AND GROUNDWATER CONDITIONS IN THE WESTERN REGION OF THE ROSWELL BASIN,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geosciences.
C. Duffy, L. W. Gelhar, and G. W. Gross.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 577, Price codes: A07 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces Report No. 100 Partial Technical Completion Report, 1978, 111 p, 18 fig, 21 tab, 29 ref, 2 append. OWRT A-055-NMEX(1), 14-34-0001-6032.

Descriptors: *Groundwater, *Groundwater recharge, Groundwater movement, *Surface-Groundwater relationships, Synthetic hydrology, Stochastic processes, Tritium, Aquifers, Springs, Wells, Streams, *Roswell Basin(N MEX), *New Mexico, *Yeso aquifer(NMEX), *Glorieta aquifer(NMEX).

An examination of recharge and groundwater conditions of the western region of the Roswell basin is presented. Recharge mechanisms are proposed on the basis of several long record observation wells. Water levels with long trends are associated with recharge from areal precipitation. It is throught that several years of above average rainfall are necessary to increase groundwater storage significantly. A fluctuating cyclic response is associated with channel leakage from streams in the study area. This recharge mechanism was verified using a stochastic stream-aquifer model applied to the Rio Hondo and Rio Penasco drainages. With this model, channel leakage and aquifer parameters could be estimated. The two types of water level response are associated with characteristic tritium levels. High tritium levels in wells near streams verify a fast recharge component indicated by the model. For wells not located near streams in the intake area and for wells in the Principal Aquifer, low tritium values are found. These wells indicate longer residence times than perviously suggested. It seems likely that precipitation on the region outside the Principal Intake Area supplies a significant portion of total recharge to the Principal Aquifer. (Stockton-N Mex)
W79-03663

FRESH GROUND WATER FOUND DEEP BENEATH NANTUCKET ISLAND, MASSACHUSETTS,
Geological Survey, Woods Hole, MA. Water Resources Div.; and Geological Survey, Boston, MA Water Resources Div
For primary bibliographic entry see Field 1A.
W79-03690

ESTIMATING GROUNDWATER RECHARGE FROM CONSERVATION BENCH TERRACES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
W. H. Neibling.
Master's Thesis, 1976. 133 p, 19 fig, 19 tab. OWRT A-068-Kan(1).

Descriptors: Hydrologic aspects, *Groundwater recharge, *Evapotranspiration, Meteorological data, Weather data, Computer models, Crop rotations, Soil properties, Soil moisture, Drainage effects, Soil types, Loam, Silts, Watersheds(Basins), Terraces(Agricultural), Water conservation, Natural recharge.

In determining the potential for groundwater recharge from conservation beach terraces a continuous water-budget type computer model was developed. Inputs or crop and soil moisture properties, and daily weather observations were used to calculate daily potential evapotranspiration, actual evapotranspiration and soil moisture changes in a 213 cm soil profile. Laboratory tests were conducted to determine the relationships of soil water potential-soil water content, ad unsaturated hydraulic conductivity-soil water content for the silt loam soil in the conservation bench terrace area study The water budget model utiliZed these relationships in calculating daily soil water movement across the 183 cm depth boundary. Weather records from 1945 through 1974 were used to make computer runs containing four model combinations or crop rotations and watershed: bench ratios utilized on the conservation bench terraces. Wheat-fallow rotation runs were made for the watershed areas. ad either wheat-fallow or continuous grain sorghum rotation runs were made on the benches. All bench areas showed a larger recharge rate than was calculated for the sloping watershed conditions. It is concluded that conservation bench terraces have the potential for ground water recharge when used on the type of soil studied; the effectiveness of the recharge structure is dependent on the choice of crop rotations and watershed: bench area ratio. (Davison-IPA)
W79-03692

HANDBOOK FOR HYDROGEOLOGISTS, VOLUME I, (SPRAVOCHNOE RUKOVODSTVO GIDROGEOLOGA).
For primary bibliographic entry see Field 4B.
W79-03798

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LYNN AND GRAZA COUNTIES, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin
For primary bibliographic entry see Field 4B.
W79-03818

CONTRIBUTIONS TO THE HYDROGEOLOGY OF ALBERTA.
Alberta Research Council, Edmonton. Groundwater Div.
Bulletin 35, 1977. 101 p. $5.00.

Descriptors: *Groundwater, *Canada, *Hydrogeology, *Water chemistry, *Mapping, Model studies, Aquifers, Aquifer characteristics, Drawdown, Wells, Water wells, Transmissivity, Permeability, Pumping, Chemicals, Surveys, Sampling, Geology, Tunnels, Computer programs, Hydrology.

Seven papers relating to the hydrogeology of Alberta, Canada, were included. Topics covered were hydrogeologic mapping, water chemical sampling, pumping tests, drawdown, dewatering, and groundwater modelling. Although all the work reported was related to Alberta, many of the techniques described should be useful in other locations. (See W79-03820 thru W79-03826) (Sims-ISWS)
W79-03819

THE HYDROGEOLOGICAL RECONNAISSANCE MAPS OF ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 7C.
W79-03820

APPARENT TRANSMISSIVITY AND ITS DETERMINATION BY NOMOGRAM,
Alberta Research Council, Edmonton. Groundwater Div
G. F. Ozoray
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 13-17, 1977. 2 fig, 6 ref.

Descriptors: *Groundwater, *Transmissivity, *Equations, Pumping, Drawdown, Geology, Hydrogeology, Hydraulic conductivity, Aquifers, Aquifer characteristics, Permeability, Hydrology, *Nomograms.

Apparent transmissivity values can provide a valuable indication of regional variations in relevant rock properties. Apparent transmissivity was calculated from the duration and rate of pumping (bailing) and from the resulting total drawdown Graphically, a straight line was substituted for the real drawdown curve, and the starting point of the time scale was arbitrarily selected as 0.1 minute (because 0 cannot be represented on the semilog paper) By definition, apparent transmissivity was then calculated with Jacob's modified non-equilibrium formula as follows: T(app) = 264 Q log (10 t)/s where: T(app) = apparent transmissivity in imperial gallons day foot (igpd ft), Q = pumping or bailing in imperial gallons minute (igpm), s = total drawdown in feet, and t = total duration of pumping or bailing in minutes. A nomogram was presented which facilitates quick graphic determination of apparent transmissivity. The construction of the nomogram was explained, and practical

examples were given for its use. (See also W79-03819)(Sims-ISWS)
W79-03821

SAMPLING OF GROUNDWATERS FOR CHEMICAL ANALYSIS,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2K.
W79-03822

CHARACTERISTICS OF PUMPING TESTS CONDUCTED IN HETEROGENEOUS CLASTIC SEDIMENTS OF THE EDMONTON AREA, ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 4B.
W79-03823

INVESTIGATION OF THE FEASIBILITY OF DEWATERING BURIED VALLEY SANDS TO AID SEWER-TUNNEL EXCAVATIONS, EDMONTON, ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8D.
W79-03824

TELEDELTOS MODELLING OF HOMOGENEOUS AND HETEROGENEOUS GROUNDWATER SYSTEMS,
Alberta Research Council, Edmonton. Groundwater Div.
R. Stein.
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 55-63, 1977. 3 fig, 5 ref.

Descriptors: *Groundwater, *Aquifers, *Model studies, *Analog models, Hydraulic conductivity, Permeability, Anisotropy, Aquifer characteristics, Analog computers, Analytical techniques, Finite element analysis, Groundwater movement, Hydrology, Hydrogeology.

Formal similarity between the laws governing flow of fluids in permeable media and electric currents allows subsurface fluid potential distributions to be modelled by electric analogy using a conductive medium such as Teledeltos paper. Such models can presently incorporate, to a certain extent, hydraulic conductivity variations both in direction and magnitude and play a useful role in the process of groundwater flow evaluation. (See also W79-03819) (Sims-ISWS)
W79-03825

DLSPLOT: A COMPUTER PROGRAM FOR TRANSLATING DOMINION LAND SURVEY COORDINATES TO UNIVERSAL TRANSVERSE MERCATOR COMPATIBLE COORDINATES,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 7C.
W79-03826

PUBLIC GROUNDWATER SUPPLIES IN HENDERSON COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-03827

SOLUTE TRAVEL-TIME ESTIMATES FOR TILE-DRAINED FIELDS: III. REMOVAL OF A GEOTHERMAL BRINE SPILL FROM OIL BY LEACHING,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 2G.
W79-03961

2G. Water In Soils

SOIL - MOISUTRE - TEMPERATURE FOR ALASKAN LOWLAND,
Alaska Univ., Fairbanks.
For primary bibliographic entry see Field 2C.
W79-03582

NITRATE ACCUMULATION IN SOILS AND LOSS IN TILE DRAINAGE FOLLOWING NITROGEN APPLICATIONS TO CONTINUOUS CORN,
Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 2K.
W79-03653

FACTORS AFFECTING ATRAZINE ADSORPTION, DEGRADATION AND MOBILITY IN SOIL,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W79-03670

SOME EFFECTS OF SOIL SURFACE COVER ON INFILTRATION,
Auburn Univ., AL.
J. L. Koon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 560, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Dissertation, August 1968, 86 p, 20 fig, 23 tab, 25 ref. OWRT A-005-ALA(2).

Descriptors: *Soil surface cover, *Infiltration rate, *Raindrop impact, *Regression analysis, *Simulated rainfall, Soil types, Infiltration, *Multiple regression techniques.

To evaluate the effects of soil surface cover on the infiltration rate of soils exposed to raindrop impact, simulated rainfall was applied at a constant rate to one soil type in small plots with free drainage, and aquare- and rectangular-cover particles of varying sizes and percentages were used as surface cover. The data were analyzed by multiple regression techniques and an expression relating the infiltration per unit length of cover perimeter to a characteristic geometrical distance was developed. The variables included in this analysis were: (1) the number of cover particles (N), (2) the perimeter of the individual cover particles (P), (3) the distance from the center of the cover particles to the center of space between cover particles (D), (4) the width of the cover particle (L), (5) the ratio of area covered (AC) to the total area (AT). The equation: $100\ I/NP = 0.12 + 2.28\ (2D - L)\ (AC/AT)$, was shown to represent the data with a high coefficient of determination.
W79-03676

DERIVATION OF EQUATIONS FOR VARIABLE RAINFALL INFILTRATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 573, Price codes: A03 in paper copy, A01 in microfiche. HYDROWAR Program, CEP76-77HJM47, Interim Report May 1977. 30 p, 7 fig, 9 ref, 2 append. OWRT B-144-COLO(4).

Descriptors: *Infilration, *Infiltration rates, *Variable rainfall, *Equations, *Ponding, Rainfall intensity, Soil moisture.

Formulae were derived for prediction of ponding time and cumulative infiltration following ponding under a condition of variable and even intermittent rainfall. The derivations do not assume immediate saturation at the surface nor a piston displacement of air by water; they include the viscous flow of air. The results were compared with experimental data for two conditions: constant rainfall and intermittent rainfall. The proposed formulae are simple to use, requiring no complex solution of a partial or even an ordinary differential equation. The numerical calculations presented in the report were performed with a small pocket calculator. The agreement with experimental data is good
W79-03681

EFFECT OF SOIL MOISTURE CONTENT UPON ADSORPTION AND MOVEMENT OF PHOSPHORUS FROM LEACHATES OF DOMESTIC WASTE DISPOSAL SYSTEMS,
Maine Univ. at Orono.
For primary bibliographic entry see Field 5B.
W79-03683

COMPARATIVE GROWTH AND FOLIAR ELEMENT CONCENTRATIONS OF LARIX LARICINA OVER A RANGE OF WETLAND TYPES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03739

MICROBIAL POPULATIONS IN FLOODED SWAMP SOILS OF SOUTH CAROLINA,
Southeastern Forest Experiment Station, Asheville, NC.
D. S. Priester, and W. R. Harms.
Research Note SE-238, Southeastern Forest Experiment Station, Asheville, North Carolina, April, 1977. 8 p, 2 fig, 4 tab, 8 ref.

Descriptors: *Swamps, *South Carolina, *Soil microorganisms, Wetlands, Aquatic microorganisms, Soil bacteria, Actinomycetes, Clostridium, Soil microbiology, Soil fungi.

The effects were investigated of three kinds of flooding, soil type, and time of year on the growth of microorganisms in swamp soil of the Wehadkee and Portsmouth series. The soils flooded with moving water had significantly more aerobes and fewer anaerobes than did soils flooded with stagnant water. Soils that were deep-flooded with moving water had greater numbers of microbes than did the soils with stagnant water and those surface-flooded with moving water. The Wehadkee soil and significantly greater populations than did the portsmouth soil, regardless of water regime. Populations were greater in the summer than in the spring and fall. The most prevalent genus of aerobic and facultatively anaerobic bacteria was Bucillus Cohn, 1872. The actinomycetes isolated were Nocardia trevisan, 1889 and Streptomyces Waksman and Henrici, 1943. The only strict anaerobe was Clostridium Prazmowski, 1880. Of the fungi, the most prevalent genera were Penicillium Link and Cladosporium Link. (Steiner-Mass)
W79-03742

AN INVESTIGATION OF THE BIOTIC FACTORS DETERMINING THE RATES OF PLANT DECOMPOSITION ON BLANKET BOG,
Durham Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W79-03760

EFFECTS OF SPARY IRRIGATION OF MUNICIPAL WASTEWATER ON THE PHYSICAL PROPERTIES OF THE SOIL,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5C.
W79-03766

DISPLACEMENT OF SOIL WATER BY SIMULATED RAINFALL,
Kentucky Agricultural Experiment Station, Lexington.
V. L. Quisenberry, and R. E. Phillips.
Soil Science Society of America Journal, Vol 42, No 5, p 675-679, September-October 1978. 3 fig, 3 tab, 15 ref.

Descriptors: *Soil moisture, *Soil water movement, *Simulated rainfall, *Leaching, Soils, Rainfall, Hydrology, Soil water, Movement, On-site

investigations, Moisture content, On-site tests, Laboratory tests, Percolation, *Tritiated water tracer, Water movement in macropores, Soil-water displacement.

Displacement of initial soil water by simulated rainfall was measured in aggregates of Maury silt loam soil in columns in the laboratory and under field conditions using tritiated water and/or Cl(-) as a tracer of added water. Displacement values measured in aggregates were larger (53 to 85%) than those measured under field conditions (7 to 56%). Percent displacement of initial soil water in Calloway silt loam under field conditions was similar to that of Maury, but was larger in Huntington silty clay loam than in Maury. Initial soil water content of Maury soil did not appear to affect percent displacement. Percent displacement in Maury soil increased as the depth of tillage increased. (Lee-ISWS)
W79-03799

A MATHEMATICAL TREATMENT OF INFILTRATION FROM A LINE SOURCE INTO AN INCLINED POROUS MEDIUM,
Colorado State Unive., Fort Collins. Dept. of Mathematics.
D. W. Zachmann.
Soil Science Society of America Journal, Vol 42, No 5, p 685-688, September-October 1978. 3 fig, 1 tab, 15 ref.

Descriptors: *Infiltration, *Hydraulic conductivity, *Porous media, *Model studies, Mathematical models, Soil water, Soil water movement, Soils, Clays, Sands, Steady flow, Equations, Soil science, Line sources.

An exact mathematical solution was obtained for two-dimensional, steady infiltration from a line source into an inclined porous medium with an impermeable lower boundary. Unsaturated hydraulic conductivity was assumed to be an exponential function of pressure head. Equations for a stream function and the pressure head were developed, and stream lines and contours of constant pressure head were plotted for a sandy soil and a clay soil using inclinations of 5 deg and 20 deg from horizontal. (Sims-ISWS)
W79-03800

CHEMICAL CHARACTERIZATION OF THE GASEOUS AND LIQUID ENVIRONMENTS OF SUBSURFACE DRAIN SYSTEMS,
Agricultural Research Service, Brawley, CA. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2K.
W79-03801

MAP UNIT COMPOSITION ASSESSMENT USING DRAINAGE CLASSES DEFINED BY LANDSAT DATA,
Soil Conservation Service, Lafayette, IN.
For primary bibliographic entry see Field 7B.
W79-03802

THE EFFECT OF STABILIZED, HYDROPHOBIC AGGREGATE LAYER PROPERTIES ON SOIL WATER REGIME AND SEEDLING EMERGENCE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
E. Rawitz, and A. Hazan.
Soil Science Society of American Journal, Vol. 42, No. 5, p 787-793, September-October 1978. 9 fig, 2 tab, 24 ref.

Descriptors: *Mulching, *Water conservation, *Soil moisture, Soil properties, Soil texture, Irrigation, Seeds, Seedbed treatment, Erosion, Laboratory tests, Evaporation, Wetting, Drying, Aggregates, Soil aggregates, Soil science, *Seedling emergence, Soil crusts.

Soil crusts affect both the profile water regime and the fate of crop seedlings. The former is affected via modification of infiltration, evaporation, and redistribution, while mechanical crust impedance prevents or retards seedling emergence. Growers alleviate this problem by frequent, small irrigations, which are costly in water, equipment, and labor. This study was conducted to determine whether surface soil properties could be modified by layers of stabilized, hydrophobic aggregates so as to render these irrigations unnecessary. Unstable aggregates of a clay-loam soil were treated with 7% potassium siliconate and 1% polyvinyl acetate based on dry-weight of soil and sprayed in water to wet the soil to 15% gravimetric water content. Layers of soil mixes with different aggregate-size distribution were placed in transparent columns and given a simulated rainfall; then the progress of infiltration, redistribution, and drying was followed. The most promising mix was used in large outdoor tanks as a mulch for carrots, using 1- and 4-cm mulch layers with 0, 25, 50, and 100% cover of the soil surface. The soil was given one post-sowing sprinkler irrigation, and the soil moisture regime was monitored by microtensiometers and a two-probe gamma gauge. A 100% cover of 4-cm deep mulch of treated aggregates was the most effective for water conservation. It decreased water loss by 20% over a 14-day period. Seedling emergence was clost to 90% under a 1-cm mulch and 50% under a 4-cm layer, both of which were superior to the unmulched control treatment. (Sims-ISWS)
W79-03803

TRANSPORT OF A NONCOHESIVE SANDY MIXTURE IN RAINFALL AND RUNOFF EXPERIMENTS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 2J
W79-03804

THE BEHAVIOR OF NUTRIENT ELEMENTS ADDED TO A FOREST SOIL WITH SEWAGE SLUDGE,
Washington Univ., Seattle. Center of Ecosystem Studies.
For primary bibliographic entry see Field 5B.
W79-03805

GRAVIMETRIC VS. VOLUMETRIC DETERMINATION OF WATER STORAGE IN VERTICALLY UNSTABLE TILLAGE LAYERS,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 7B.
W79-03806

COMPARISON OF CALCULATED AND EXPERIMENTALLY DETERMINED VALUES OF SOIL-WATER DIFFUSIVITY,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
F. El-Komos, M. C. Oswal, and S. S. Khanna.
Journal of Hydrology, Vol 39, No 1/2, p 105-111, October 1978. 3 fig, 1 tab, 10 ref

Descriptors: *Soil moisture, *Diffusivity, *Unsaturated flow, *Soil water movement, Soil physics, Pore pressure, Drainage, On-site tests, Porous media, Laboratory tests, Unsteady flow, Conductivity, Experiments.

Soil water diffusivity values of a sandy loam soil, measured by Bruce and Klute's and Gardner's methods, were compared with those calculated from the moisture-suction relationship. The measured values of diffusivity were correlated significantly with calculated values of diffusivity. Bruce and Klute's method overestimated diffusivity values at different moisture contents compared with those calculated from the moisture-suction reltionship. Diffusivity values measured by Gardner's method and those calculated were almost identical. (Adams-ISWS)
W79-03812

NATIONAL CONFERENCE ON MANAGEMENT OF NITROGEN IN IRRIGATED AGRICULTURE.
For primary bibliographic entry see Field 5G
W79-03941

LEACHING OF NITRATE FROM SOILS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 5G.
W79-03948

SOLUTE TRAVEL-TIME ESTIMATES FOR TILE-DRAINED FIELDS: III. REMOVAL OF A GEOTHERMAL BRINE SPILL FROM OIL BY LEACHING,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
W. A. Jury, and L. V. Weeks.
Soil Science Society of America Journal, Vol. 42, No. 5, p 679-684, September-October 1978. 7 fig, 3 tab, 10 ref.

Descriptors: *Leaching, *Salts, *Ion exchange, *Model studies, Mathematical models, Groundwater movement, Solutes, Saline water, Brines, Tile drains, Tile drainage, Soils, Soil water, Thermal water, Travel time.

The time required to leach a slug of saline, sodic geothermal brine from the point of injection to the tile outlet of an artificially drained field was calculated. Sprinkler, complete, and partial ponding leaching methods were compared as a function of drain spacing and initial location of the spill. Calculated results were presented as dimensionless parameters which scale the drainage system dimensions and the soil water transport properties. Ponded leaching required more water, but less time to leach brine out of the system for all situations except where the brine spill occurs near the midpoint between tile lines. A simple calculation was proposed to estimate the leaching fluid volume required to remove excess Na(+) from the exchange complex. Good agreement was attained between simulated and experimental results involving a laboratory soil column. For fine-textured soils in the Imperial Valley of California, it may require up to 30 pore vlumes of leaching fluid to replace Na(+) with Ca(2+) if saturated gypsum solution is used in reclamation. Application time per pore volume was calculated to be in excess of 1 year for all cases except ponded leaching directly over a tile line. (See also W76-05905 and W76-05904) (Sims-ISWS)
W79-03961

COUPLING PHENOMENA IN SATURATED HOMO-IONIC MONTMORILLONITE: III. ANALYSIS,
Guelp Univ. (Ontario). Dept. of Land Resource Science
P H Groenevelt, D E Elrick, and T J M Blom
Soil Science Society of America Journal, Vol. 42, No. 5, p. 671-674, September-October 1978. 1 fig, 2 tab, 3 ref.

Descriptors: *Montmorillonite, *Ion transport, *Equations, *Mathematical models, Evaluation, Data processing, Electrodes, Sodium, Chlorides, Clays, Zeta potential, Electrochemistry, Cations, Clay-water-salt systems, Data analysis, Transport equations.

The data presented in the first paper of this series were analyzed using the theoretical transport equations and the analytical expressions for the transport equations and the analytical expression for the transport coefficients developed in the second paper of the series. When the electrodes of the system presented in Part I of this series are not shorted, the predicted behavior corresponds precisely with the actual behavior. Upon shorting the electrodes, the data indicated that the actual shorting of the clay-water system is not perfect, an indication that the electrodes cannot release and absorb Cl-ions infinitely fast. From the data, the shorting efficiency was calculated. The flux of cations through the clay-water system while the electrodes are shorted then can be calculated. The absolute value of this flux appears to be slightly larger than the value calculated from the decrease

in time of the salt concentration difference in the two liquid compartments. This is likely due to the buildup of a salt concentration gradient in the membranes. (See also W77-01138, W77-05420) (Visocky-ISWS)
W79-03962

INVESTIGATION OF LANDFILL LEACHATE POLLUTANT ATTENUATION BY SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W79-03983

FACTORS INFLUENCING THE VOLATILIZATION OF MERCURY FROM SOIL,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5B.
W79-03988

2H. Lakes

THE DECLINE OF LAKE PLANTS,
For primary bibliographic entry see Field 5C.
W79-03508

THE BLUE-GREEN ALGAE KEEP COMING,
For primary bibliographic entry see Field 5C.
W79-03510

SURVIVAL AND VIABILITY OF ESCHERICHIA COLI IN A THERMALLY ALTERED RESERVOIR,
Savannah River Lab., Aiken, SC.
For primary bibliographic entry see Field 5C.
W79-03556

RETARDATION OF SEDIMENT PHOSPHORUS RELEASE BY FLY ASH APPLICATION,
Notre Dame Univ., IN.
For primary bibliographic entry see Field 5C.
W79-03560

DEMONSTRATION OF INTERIM TECHNIQUES OF POLLUTED BEACHWATER,
Cleveland Dept. of Public Works, OH.
For primary bibliographic entry see Field 5G.
W79-03576

SEMI-INFINITE SOLID MODEL FOR PREDICTION OF TEMPERATURE IN DEEP RESERVOIRS AND LAKES,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
L. J. Thibodeaux.
Water Resources Bulletin, Vol. 11, No. 3, p 449-454, June 1975. 2 fig, 1 tab, 5 ref. OWRT A-026-ARK(1).

Descriptors: *Mathematical models, *Lakes, *Thermal properties, *Thermocline, Isotherms, Water properties, Reservoirs, Energy equation, Equations, *Arkansas.

A proposed thermal model to accompany a primary production model for the eutrophication processes in lakes is presented. A lake, visualized as a solid body occupying the space from X=D to X= infinity, is heated mainly through the air-water interface. Mathematical equations give the surface temperature, the temperature profile, including depth, and the position of the thermocline as a function of time. Preliminary tests of the interpretative and predictive aspects of the proposed model were carried out using temperature field data on Beaver Reservoir in Northwest Arkansas. In deep fresh water bodies, the general shape of the temperature profile is structured by the net heat input at the air-water interface and the time lapse since an isotherm state existed. (Davison-IPA)
W79-03581

CADMIUM AND ZINC IN MUSCLE OF BLUEGILL (LEPOMIS MACROCHIRUS) AND LARGEMOUTH BASS (MICROPTERUS SALMOIDES) FROM AN INDUSTRIALLY CONTAMINATED LAKE,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5A.
W79-03640

THE LANDSAT LAKE EUTROPHICATION STUDY,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 7B.
W79-03682

ECOLOGICAL DISTRIBUTION OF BREEDING WATERFOWL POPULATIONS IN NORTH DAKOTA.
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2I.
W79-03732

SEASONAL CHANGES IN THE STANDING CROP OF TWO MONTANE SEDGES,
Minnesota Univ., Minneapolis. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03734

VEGETATION CHANGES IN SHALLOW MARSH WETLANDS UNDER IMPROVING MOISTURE REGIME,
Canadian Wildlife Service, Saskatoon (Saskatchewan).
For primary bibliographic entry see Field 2I.
W79-03735

PRIMARY PRODUCTION AND LIFE HISTORY OF CAREX LACUSTRIS,
Ithaca Coll., NY. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-03737

COMPARATIVE GROWTH AND FOLIAR ELEMENT CONCENTRATIONS OF LARIX LARICINA OVER A RANGE OF WETLAND TYPES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03739

AN ANALYSIS OF LAKE LEVEL INFLUENCE ON VEGETATION IN LAKE CHAMPLAIN,
Aquatec, Inc., South Burlington, VT.
W. D. Countryman.
Fish and Wildlife Service, Newton Corner, Massachusetts, August, 1977. 2 fig, 117 ref, 4 append.

Descriptors: *Wetlands, *Lake Champlain, *Water levels, *Vegetation effects, Marshes, Freshwater marshes, Marsh management, Reservoir management, Lakes.

If water levels were controlled so as not to exceed 30.5 meters, only minor changes in existing wetland plant communities would occur. The major plant association to be affected by such a regulation scheme would be the grass and sedge meadow community. Historically, the areas occupied by this plant association are only inundated for short periods of time in the spring and only in years of high water. If water levels were controlled so as not to exceed 30.0 meters, a slight loss of swamp forest community would occur in addition to the loss of the grass and sedge meadow. Regulation so as not to exceed 29.5 meters would result in the loss of much of the swamp forest and slight changes in the emergent plant community. If water levels were regulated so as not to exceed 29.0 meters, major changes to all marsh land vegetation communities would occur. (Steiner-Mass)
W79-03745

PHENOLOGY, DISTRIBUTION, AND SURVIVAL OF ATRIPLEX TRIANGULARIS WILLD. IN AN OHIO SALT PAN,
Ohio Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03749

NUTRIENT AND WATER LEVELS IN A SMALL MICHIGAN BOG WITH HIGH TREE MORTALITY,
Michigan Univ., Pellston. Biological Station.
For primary bibliographic entry see Field 2I.
W79-03751

MINERAL CONCENTRATIONS IN PAPYRUS IN VARIOUS AFRICAN SWAMPS,
Nairobi Univ. (Kenya). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03753

PRIMARY PRODUCTION IN THE FRESHWATER MARSH ECOSYSTEM OF TROY MEADOWS, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Botany.
R. A. Jervis.
Bulletin of the Torrey Botanical Club, Vol. 96, No. 2, p 209-231, 1969. 7 fig, 5 tab, 59 ref.

Descriptors: *Freshwater marshes, *New Jersey, *Primary productivity, Wetlands, Marshes, Marsh plants, Productivity, Cattails, Rooted aquatic plants, Efficiencies.

Primary production was studied in four freshwater marsh communities: an open aquatic system of emergent and floating plsants, a cattail community, a swale of sedge tussocks and associated herbaceous tussock colonists, and a sedge-shrub thicket. Although the four communities differed considerably in vegetative structure, they did not differ significantly in production rates or production efficiencies (production per unit of leaf surface). The seasonal course of production varied among species and among communities. In general, early summer was the most productive period. It followed a springtime development of photosynthetic capital, which was most rapid in the predominantly rhizomatous cattail community when there was a marked recall of stored foods. Production thereafter decreased except for a slight fall upswing. The estimated average (9.50 g/sq m/day) and maximum (20.94 g/sq m/day during the early summer) productivities are among the highest reported for natural vegetation. Soil colloids and the ground water nutrient level were high, and it is suggested that these variables, along with the abundance of soil moisture and an unusually well-adapted flora, are the major factors contributing to the high marsh productivity. (Steiner-Mass)
W79-03758

PRODUCTION, NUTRIENT CONTENT AND DECOMPOSITION OF PHRAGMITES COMMUNIS TRIN. AND TYPHA ANGUSTIFOLIA L.,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2I.
W79-03759

AN INVESTIGATION OF THE BIOTIC FACTORS DETERMINING THE RATES OF PLANT DECOMPOSITION ON BLANKET BOG,
Durham Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W79-03760

CULTURAL EUTROPHICATON OF LONG LAKE, WASHINGTON,
Eastern Washington State Coll., Cheney. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03777

SCENARIO FOR AN ONGOING CHLOROPHYLL A SURVEILLANCE PLAN ON LAKE ONTARIO FOR NON-INTENSIVE SAMPLING YEARS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W79-03808

POTENTIAL SOURCES OF ASBESTOS IN LAKE MICHIGAN,
Illinois Univ. at the Medical Center, Chicago. School of Public Health.
For primary bibliographic entry see Field 5B.
W79-03809

MIREX IN THE SEDIMENTS OF LAKE ONTARIO,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
For primary bibliographic entry see Field 5B.
W79-03810

THEORETICAL MODEL OF THE LITTORAL DRIFT SYSTEM IN THE TORONTO WATERFRONT AREA, LAKE ONTARIO,
Scarborough Coll., Toronto (Ontario).
B. Greenwood, and D. G. McGillivray.
Journal of Great Lakes Research, Vol. 4, No. 1, p 84-102, March 1978. 14 fig, 3 tab, 72 ref.

Descriptors: *Littoral drift, *Lake Ontario, *Model studies, Mathematical models, Waves(Water), Lakes, Shores, Beaches, Geomorphology, Erosion, Deposition(Sediments), Sediment transport, Winds, Climatology, Theoretical analysis.

A computer model was described which simulated the interaction between shoreline geometry and shoaling waves in the Toronto waterfront area on the north shore of Lake Ontario, between Highland Creek in the east and the Credit River in the west, and established potential littoral drift patterns. Thirteen wave conditions, defined by height, period and direction of approach, characterizing the annual hindcast spectrum for Toronto, were used in the determination of the shore-parallel components of wave energy flux. To identify the long-term net effects of the distribution of wave energy flux which produce the dominant littoral drift pattern, a simple summation procedure was used whereby the individual effect of any wave condition at a shoreline point is weighted according to its frequency of occurrence. The long-term average pattern of potential littoral drift, based on zones of potential erosion (increasing alongshore wave energy flux), transport (constant alongshore wave energy flux), and deposition (decreasing alongshore wave energy flux), was established. Identification of nodal points (zero alongshore wave energy flux) and drift cells allows a test of the 'geomorphological sense' of the model by comparison with observed drift patterns. (Sims-ISWS)
W79-03811

CARBON FLOW IN FOUR LAKE ECOSYSTEMS: A STRUCTURAL APPROACH,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W79-03815

SYMPOSIUM: EXPERIMENTAL USE OF ALGAL CULTURES IN LIMNOLOGY; SANDEFJORD, NORWAY, 26-28 OCTOBER 1976.
Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Stuttgart (Germany, F.R.).
For primary bibliographic entry see Field 5C.
W79-03842

ANATOXINS FROM CLONES OF ANABAENA FLOS-AQUAE ISOLATED FROM LAKES OF WESTERN CANADA,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-03870

THE USE OF NATURAL PHYTOPLANKTON POPULATIONS IN BIOASSAY,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5A.
W79-03876

USE OF LABORATORY CULTURES OF SELENASTRUM, ANABAENA AND THE INDIGENOUS ISOLATE SPHAEROCYSTIS TO PREDICT EFFECTS OF NUTRIENT AND ZINC INTERACTIONS UPON PHYTOPLANKTON GROWTH IN LONG LAKE, WASHINGTON,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W79-03877

THE APPLICATION OF CULTURE METHODS IN STUDIES OF THE ECOLOGY OF SMALL GREEN ALGAE,
University Coll. of North Wales, Bangor. School of Plant Biology.
For primary bibliographic entry see Field 5A.
W79-03878

THE USE OF SMALL, CONTINUOUS AND MULTISPECIES CULTURES TO INVESTIGATE THE ECOLOGY OF PHYTOPLANKTON IN A SCOTTISH SEA-LOCH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
For primary bibliographic entry see Field 5C
W79-03879

THE ALGAL GROWTH POTENTIAL OF AN INLAND SALINE AND EUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03891

COHO SALMON (ONCORHYNCHUS KISUTCH) AND HERRING GULLS (LARUS ARGENTATUS AS INDICATORS OF ORGANOCHLORINE CONTAMINATION IN LAKE ONTARIO,
Canadian Wildlife Service, Ottawa (Ontario). Wildlife Toxicology Div.
For primary bibliographic entry see Field 5A.
W79-03895

CORRELATIONS BETWEEN SPECIFIC ALGAE AND HEAVY METAL BINDING IN LAKES,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03896

DYNAMICS OF AN ICE COVERED LAKE WITH THROUGH-FLOW,
Goteborg Univ. (Sweden). Dept. of Oceanography.
A. Stigebrandt.
Nordic Hydrology, Vol 9, No 3/4, p 219-244, 1978. 10 fig, 3 tab, 15 ref, 5 append.

Descriptors: *Lakes, *Ice cover, *Dynamics, Flow, Temperature, Water temperature, Circulation, Mixing, Heat transfer, Discharge(Water), Withdrawal, Theoretical analysis, Model studies, On-site investigations, Limnology, Water circulation, *Sweden.

The dynamics of different regimes in an ice covered inland lake with through-flow were discussed. A new theory for selective withdrawa was tested with success. The mixing of the entering river with lake water was estimated, and it was found that the net volume flux increases about 60% through the mixing. The flow in the main part of the lake was discussed, and some measurements were presented (Sims-ISWS)
W79-03898

BALANCE OF ORGANIC MATTER IN THE ECOSYSTEM OF THE RYBINSKIY RESERVOIR,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod
For primary bibliographic entry see Field 5C.
W79-03918

HISTORY OF CHANGES IN FISH SPECIES OF THE GREAT LAKES,
For primary bibliographic entry see Field 5C.
W79-03924

SEA LAMPREY (PETROMYZON MARINUS LINNAEUS) IN THE SAINT LAWRENCE GREAT LAKES OF NORTH AMERICA: EFFECTS, CONTROL, RESULTS,
For primary bibliographic entry see Field 5C.
W79-03925

GEOLOGIC POLLUTION PROBLEMS OF LAKE SUPERIOR,
For primary bibliographic entry see Field 5B.
W79-03938

DISTRIBUTION OF PHYTOPLANKTON IN ILLINOIS LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03989

DISTRIBUTION OF PHYTOPLANKTON IN NORTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03990

DISTRIBUTION OF PHYTOPLANKTON IN INDIANA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03991

POLYCHLORINATED BIPHENYLS IN PRECIPITATION IN THE LAKE MICHIGAN BASIN,
DePaul Univ., Chicago, IL.
For primary bibliographic entry see Field 5C.
W79-03993

SIZE DEPENDENT MODEL OF HAZARDOUS SUBSTANCES IN AQUATIC FOOD CHAIN,
Manhattan Coll., Bronx, NY
For primary bibliographic entry see Field 5C.
W79-03997

2I. Water In Plants

QUANTITATIVE ESTIMATION OF LIVING WHEAT-ROOT LENGTHS IN SOIL CORES,
Agricultural Research Service, Pendleton, OR. Columbia Plateau Conservation Research Center.
For primary bibliographic entry see Field 3F
W79-03514

EFFECTS OF SOIL WATER STRESS ON GROWTH AND NUTRIENT ACCUMULATION IN CORN,
Kasetsart Univ., Bangkok (Thailand). Dept. of Soil Science.
For primary bibliographic entry see Field 3F
W79-03553

THE EFFECT OF COMPETITION AND SALINITY ON THE GROWTH OF A SALT MARSH PLANT SPECIES,
California Univ., Davis. Dept. of Botany.
M. G. Barbour.
Oecologia, Vol. 37, p 93-99, 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Plant growth, *Salinity, *Salt marshes, *Competition, Rhizomes, Salt tolerance, Perennial ryegrass, Habitats, Plant growth regulators, Plant physiology, Ecology, Halophytes, *Jaumean.

Young rhizome sprouts of the herbaceous perennial Jaumea carnosa were propagated from material collected in a salt marsh along the central California coast. The sprouts were transplanted to flats of sand sown with different densities of seeds of a representative glycophyte, Lolium perenne. In the monospecific control flats, the growth of both species declined with increasing salinity, but the relative decline of Lolium was three times that of Jaumea. Both species grew well when subirrigated by 400 ppm salt water, but grew poorly when subirrigated by 11,600 ppm salt water, indicating that aeration alone is not the most significant factor in the marsh. The effect of interspecific competition on Jaumea was marked at low salinity, depressing growth by 52% compared to controls, but at high salinity the competitive effect was insignificant, whether the plants were watered from above or subirrigated. This supports the hypothesis that intolerant halophytes such as Jaumea are restricted in nature to salt marshes because they are poor competitors with glocophytes on non-saline soils. (EIS-Deal)
W79-03634

CLASSIFICATION OF RIPARIAN HABITAT IN THE SOUTHWEST,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ.
C. P. Pase, and E. F. Layser.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43 p. 5-9. 8 fig, 13 ref.

Descriptors: *Riparian plants, *Vegetation, *Southwest U.S., *Classification, Arizona, New Mexico, Trees, Streams, Wetlands, Habitats.

A tentative classification system based on the work of Brown and Lowe is proposed as a working model. Six biomes, nine series, and 23 associations are recognized. (Stihler-Mass)
W79-03704

IMPORTANCE OF RIPARIAN ECOSYSTEMS: BIOTIC CONSIDERATIONS,
New Mexico Dept. of Game and Fish, Santa Fe.
J. P. Hubbard.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 14-18. 1 tab, 18 ref.

Descriptors: *Riparian land, *Wildlife, *Habitats, Fish, Birds, Amphibians, Mammals, Southwest U.S., Wetlands, Ecosystems.

Riparian Ecosystems are of importance in maintaining the large degree of biotic diversity of the southwestern United States. Such habitats are of paramount importance in the survival of native fishes. Amphibians are seasonally dependent on riparian habitats. A number of bird species are dependent on riparian ecosystems; some mammal species also show this dependence. (Stihler-Mass)
W79-03706

VEGETATION STRUCTURE AND BIRD USE IN THE LOWER COLORADO RIVER VALLEY,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
B. W. Anderson, and R. D. Ohmart.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 23-34. 1 fig, 6 tab, 27 ref.

Descriptors: *Riparian land, *Birds, *Habitats, Structure, Seasonal, Habitat breadths, *Colorado River Valley.

Correlations between bird population parameters and vegetation structure characteristics were found to vary seasonally. Mean habitat breadth of all species is narrowest with respect to vegetative structure in winter and broadest in summer; permanent residents occupy the structural types more evenly than visitors. Habitat breadth of various species is greater in summer than in winter. Narrow habitat breadths are accompanied by reduced habitat overlap among the species in winter, suggesting that winter is potentially the time of greatest stress. Permanent residents tend to be less specialized with respect to structure than visitors. (Stihler-Mass)
W79-03708

A RIPARIAN CASE HISTORY; THE COLORADO RIVER,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
For primary bibliographic entry see Field 6G.
W79-03709

ENDANGERED SPECIES VS. ENDANGERED HABITATS: A CONCEPT,
Grand Canyon National Park, AZ.
For primary bibliographic entry see Field 6G.
W79-03713

RIPARIAN RESEARCH NEEDS,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ.
For primary bibliographic entry see Field 6G.
W79-03714

CLASSIFICATION OF RIPARIAN VEGETATION,
New Mexico State Univ., University Park. Dept. of Biology.
W. A. Dick-Peddie, and J. P. Hubbard.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 85-90. 13 ref.

Descriptors: *Riparian plants, *Riparian land, *Classification, *New Mexico, Southwest U.S., Trees, Vegetation, Rooted aquatic plants, Wetlands, Streams.

A classification system for riparian vegetation in New Mexico is presented. It is based upon obligate riparian species and the major topographic features which dictate their presence. (Stihler-Mass)
W79-03715

AN OVERVIEW OF RIPARIAN FORESTS IN CALIFORNIA: THEIR ECOLOGY AND CONSERVATION,
California Univ., Davis. Inst. of Ecology.
A. Sands, and G. Howe.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 98-115. 1 tab, 60 ref.

Descriptors: *Riparian land, *California, *Forests, Riparian plants, Trees, Vegetation, Rooted aquatic plants, Wetlands, Flood plains, Birds, Fish, Flood control, Erosion, Streams, Rivers, Geology, Sacramento River(Calif), Army Corps of Engineers.

This paper is comprised of abstracts from presentations made at the Symposium on Riparian Forests in California: Their Ecology and Conservation held in Davis, California on May 14, 1977. Presentation titles are: A short review of the status of riparian forests in California, Geological history of the riparian forests of California, Riparian forests of the Sacramento Valley, California, The fluvial system: Selected observations, Riparian vegetation and flora of the Sacramento Valley, The valley riparian forests of California and their inmportance to bird populations, Habitats of native fishes in the Sacramento River Basin, and Environmental Applications in Corps of Engineers work with refernce to riparian vegetation management. (Stihler-Mass)
W79-03716

REGENERATION AND DISTRIBUTION OF SYCAMORE AND COTTONWOOD TREES ALONG SONOITA CREEK, SANTA CRUZ COUNTY, ARIZONA,
Arizona State Univ., Tempe. Dept. of Zoology.
R. L. Glinski.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 116-123. 2 fig, 1 tab, 9 ref.

Descriptors: *Riparian plants, *Riparian land, *Trees, *Sycamore trees, *Cottonwoods, Arizona, Streams, Grazing, Habitats, Erosion, Wetlands, Southwest U.S., Reproduction.

Sycamores reproduced from root and trunk sprouts and because of this their distribution is not as likely to change significantly. Cottonwood reproduction was nearly absent in areas grazed by cattle, and was confined to the narrow erosion channel. If this regeneration pattern continues, the future maximum width of the cottonwood forest will decrease nearly 60%. (Stihler-Mass)
W79-03717

INFLUENCES OF RIPARIAN VEGETATION ON AQUATIC ECOSYSTEMS WITH PARTICULAR REFERENCE TO SALMONID FISHES AND THEIR FOOD SUPPLY,
Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forestry Sciences Lab.
W. R. Meehan, F. J. Swanson, and J. R. Sedell.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 137-145. 4 fig, 26 ref.

Descriptors: *Riparian land, *Salmonids, *Habitats, *Effects, *Riparian plants, Streams, Wetlands, Time, Temperature, Sediments, Vegetation, Grazing, Insects, Fish, Southwest U.S.

The riparian zone has important influences on the total stream ecosystem including the habitat of salmonids. Shade and organic detritus from the riparian zone control the food base of the stream and large woody debris influences channel morphology. The effectiveness of a riparian zone in regulating input of light, dissolved nutrients and litterfall to the stream varies through time following wildfire, clearcutting or other disturbances. The influence and role of riparian vegetation will vary with stream order and position along the continuum from headwaters to mouth. Riparian zones are affected by livestock grazing, logging, and road construction. (Stihler-Mass)
W79-03720

ECOLOGICAL STUDY OF SOUTHWESTERN RIPARIAN HABITATS: TECHNIQUES AND DATA AVAILABILITY,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
For primary bibliographic entry see Field 6G.
W79-03721

THE IMPORTANCE OF RIPARIAN HABITAT TO MIGRATING BIRDS,
Museum of Northern Arizona, Inc., Flagstaff.
L. E. Stevens, B. T. Brown, J. M. Simpson, and R. R. Johnson.
In: Importance, Preservation and Management of

Group 2I—Water In Plants

Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 156-164. 2 fig, 4 tab, 24 ref.

Descriptors: *Migratory birds, *Riparian land, *Southwest U.S., *Ecological distribution, Ecology, Birds, Wildlife, *Riparian plants, Vegetation, Habitats, Wetlands, Streams, Rivers.

Seven pairs of study sites in riparian and adjacent, nonriparian habitats were censused for spring migrant passerines. Riparian plots contained up to 10.6 times the number of migrants per hectare found on adjacent, nonriparian plots. Stop-over habitat selection is indicated by differing migrant densities and species diversities in various habitats. Insectiverous migrants generally preferred riparian habitats. Granivores displayed habitat selection by avoiding dense riparian forests and woodland situations and concentrated in adjacent shrublands and open riparian forests. (Stihler-Mass)
W79-03722

SIGNIFICANCE OF RIO GRANDE RIPARIAN SYSTEMS UPON THE AVIFAUNA,
National Park Service, Santa Fe, NM. Southwest Region.
R. H. Wauer.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 165-174. 1 tab, 24 ref.

Descriptors: *Rio Grande River, *Riparian land, *Birds, Habitats, Riparian plants, Vegetation, Wildlife, Wetlands, Rivers, *Texas, Migratory birds, Southwest U.S.

The Rio Grande corridor in West Texas serves as a significant migratory and emigration route for avifauna, and 38 species are known to meet within the riparian habitat. A total of 94 species are known to breed within riparian systems within the American Southwest. The Rio Grande area provides suitable habitat for 40% of those. Nine species--great blue and green herons, peregrine falcon, American kestrel, white-winged dove, screech owl, Bell's vireo, yellow warbler, and bronzed cowbird--are discussed as indicators of changes within the system and the importance of the Rio Grande area as a refugium. (Stihler-Mass)
W79-03723

POPULATION FLUCTUATIONS IN NOCTURNAL RODENTS IN THE LOWER COLORADO RIVER VALLEY,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
B. W. Anderson, J. Drake, and R. D. Ohmart.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 183-192. 9 fig, 2 tab, 8 ref.

Descriptors: *Colorado River, *Mammals, *Rodents, *Cycles, Seasonal, Riparian land, Vegetation, Willow trees, Mesquite, Rivers, Wetlands, Southwest U.S., Wildlife.

An examination of population fluctuations in a sample of over 10,000 rodents comprising five species collected along the lower Colorado River revealed distinct seasonal (annual) cycles in Perognathus penicillatus and Dipodomys merriami. Overall rodent populations were decreasing for the 3.5 year period for which data are presented. This was most pronounced in Peromyscus eremicus. Although these populations were declining, there was significant intraspecific asynchrony among the populations in different vegetation types. There was also a significant degree of interspecific asynchrony in population fluctuations which renders the task of evaluating habitat difficult and subject to error unless carried out for several years in various vegetation types. (Stihler-Mass)
W79-03725

CLIMATOLOGICAL AND PHYSICAL CHARACTERISTICS AFFECTING AVIAN POPULATION ESTIMATES IN SOUTHWESTERN RIPARIAN COMMUNITIES USING TRANSECT COUNTS,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies
For primary bibliographic entry see Field 2B.
W79-03726

SOUTHWESTERN RIPARIAN COMMUNITIES: THEIR BIOTIC IMPORTANCE AND MANAGEMENT IN ARIZONA,
Arizona Game and Fish Dept., Phoenix.
For primary bibliographic entry see Field 6G.
W79-03727

TERRESTRIAL MAMMALS OF THE RIPARIAN CORRIDOR IN BIG BEND NATIONAL PARK,
Texas A and M Univ., College Station Dept. of Wildlife and Fisheries Sciences.
W. J. Boeer, and D. J. Schmidly.
In: Importance, Preservation & Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona USDA Forest Service General Technical Report RM-43, p. 212-217. 2 tab, 15 ref.

Descriptors: *Riparian land, *Mammals, *Southwest U.S., *Rodents, *Rio Grande River, Wildlife, Vegetation, Trees, Cottonwoods, Willow trees, Habitats, Wetlands, Streams, Rivers, Grazing, Livestock, *Big Bend National Park, Saltcedar, *Texas.

Thirty species of terrestrial mammals inhabit riparian habitats in Big Bend National Park (BBNP) but only one species (the beaver, Castor canadensis) is restricted to those areas. Major changes in vegetation during the past 30 years, involving an increase in basal and canopy cover, have resulted in the elimination of at least one species (Ord's kangaroo rat, Dipodomys ordii) from the river corridor as well as increased abundance and distribution of two other species (Hispid cotton rat, Sigmodon hispidus and white-footed mouse, Peromyscus leucopus). Compared to other major plant communities in BBNP, the rodent fauna of the riparian community has lower evenness, richness, and diversity indices. Human use and trespass livestock grazing are the major impact acting upon the natural riparian communities in BBNP today. (Stihler-Mass)
W79-03728

IMPORTANCE, PRESERVATION, AND MANAGEMENT OF RIPARIAN HABITAT: AN OVERVIEW,
Museum of Northern Arizona, Inc., Flagstaff Dept. of Biology.
For primary bibliographic entry see Field 6G.
W79-03729

SPECIALIZED HABITAT REQUIREMENTS OF BIRDS: SNAG MANAGEMENT, OLD GROWTH, AND RIPARIAN HABITAT,
Pacific Northwest Forest and Range Experiment Station, La Grande, OR
E. L. Bull.
In: Workshop on Nongame Bird Habitat Management in Coniferous Forests of the Western United States, Portland, Oregon, February 7-9, 1977. p 74-82. 2 fig, 6 tab, 25 ref.

Descriptors: *Wildlife habitat, Non-game birds, *Riparian land, Habitats, Birds, Wildlife, Songbirds, Wildlife management, Wetlands, Forests.

The values, roles, and management of snags, old-growth forests, and riparian zones, are discussed as they relate to birds in forest ecosystems. Riparian habitat is an extremely critical and unique type. Riparian makes up the smallest percentage in land area of the habitat types, yet it is the most important habitat to wildlife whether it is in the Coast Ranges or on the desert. A diversity of birdlife is possible because of the diversity of habitat components with riparian zones. This diversity enhances the richness and stability of the ecosystem over time and space. (Steiner-Mass)
W79-03731

ECOLOGICAL DISTRIBUTION OF BREEDING WATERFOWL POPULATIONS IN NORTH DAKOTA.
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
R. E. Stewart, and H. A. Kantrud.
Journal of Wildlife Management, Vol. 37, No. 1, p 39-50, January, 1973. 2 fig, 6 tab, 12 ref.

Descriptors: *Grasslands, *Potholes, *Wetlands, *Ecological distribution, *Waterfowl, Wildlife, Freshwater marshes, Ecology, Water levels, Ponds, Marshes, *North Dakota, Habitats, Animal populations.

The total wetland acreage in North Dakota was estimated as about 3.2 million acres. Natural basin wetland varied from a low of about 4% of total wetland acreage in the Southwestern Slope Region to a high of 93% in the Prairie Pothole Region, where about 84% of the statewide duck population occurred. Within the Prairie Pothole Region seasonal (Class III) ponds comprised 36 and 23%, respectively, of the total acreage and number of wetlands, and semipermanent (Class IV) ponds and lakes comprised 18 and 3%, respectively, of these totals. Agriculture has had drastic effects on wetlands in this region. In the Prairie Pothole Region, seasonal ponds and semipermanent ponds and lakes were utilized by about 48 and 27%, respectively, of the total breeding ducks. Optimum environmental conditions for breeding dabbling ducks were present during years when large numbers and acreages of seasonal (Class III) pond basins contained surface water. Semipermanent (Class IV) ponds and lakes were the principal habitats for breeding diving ducks, and were also important to dabbling ducks, particularly during dry years. (Howard-Mass)
W79-03732

THE LIFE HISTORY OF SHOOTS OF CAREX LACUSTRIS,
Ithaca Coll., NY. Dept. of Biology.
J M Bernard
Canadian Journal of Botany, Vol. 53, No. 3, p. 256-260, February 1, 1975. 5 fig, 1 tab, 10 ref.

Descriptors: *Freshwater marshes, *Rooted aquatic plants, *Life history studies, Wetlands, Marshes, Plant growth, Period of growth, *Sedges, *New York.

Most shoots of Carex lacustris live for about 12 to 14 months, emerging in autumn overwintering as shoots of up to 50 cm in length, and maturing during the next summer. Others emerge in early spring but both groups die in late autumn. A third class emerges in late July or August, grow to be over 50 cm in length, and die in late autumn living only 2 or 3 months. Flower initials in this species begin growth in the September to October period and overwinter while about 1.0 cm in length. The shoots that develop inflorescences are in general longer, heavier, and have a greater basal diameter than those shoots which do not flower. More shoots flower if the water level in the marsh was high the previous year. (Howard-Mass)
W79-03733

SEASONAL CHANGES IN THE STANDING CROP OF TWO MONTANE SEDGES,
Minnesota Univ., Minneapolis Dept. of Botany
E. Gorham, and M. G. Somers
Canadian Journal of Botany, Vol. 51, No. 6, p 1097-1108, June, 1973. 13 fig, 1 tab, 8 ref.

Descriptors: *Wetlands, *Standing crops, *Rooted aquatic plants, *Productivity, *Rocky Mountain Region, Canada, Biomass, Ecology, *Seasonal, Life history studies, Sedges.

Aboveground green biomass of a montane pure stand of Carex rostrata varies from about 125 g sq

m (air-dry weight) at the end of November to about 640 g/sq m in early August. The maximum production rate of about 6 g/sq m per day occurs in May. For a nearby stand of Carex aquatilis with a prominent moss layer the aboveground green biomass of sedge material varies from about 40 g/sq m in February to about 380 g/sq m in mid-August. The maximum production rate for sedge material is about 4 g/sq m per day in July. Both species exhibit two main populations of shoots, one emerging in late summer and the other through winter and early spring. The winter and spring shoots of Carex rostrata flower and die after about 18 months, while the late summer shoots, which do not mature vegetatively until the following summer, have a life-span of about 2 years. The late summer shoots of Carex aquatilis mature vegetatively before winter, and flower and die within about 12 months; while the winter and spring shoots live through the next winter, and flower and die the following summer after a life-span of about 18 months. (Howard-Mass)
W79-03734

VEGETATION CHANGES IN SHALLOW MARSH WETLANDS UNDER IMPROVING MOISTURE REGIME,
Canadian Wildlife Service, Saskatoon (Saskatchewan).
J. B. Miller.
Canadian Journal of Botany, Vol. 51, No. 8, p 1443-1457, August, 1973. 1 fig, 8 tab, 21 ref.

Descriptors: *Freshwater marshes, *Potholes, *Succession, *Moisture, *Rooted aquatic plants, *Submerged plants, Wetlands, Flooding, Marsh management, Canada, Vegetation establishment, Ecology, Ecological distribution.

Decreases in density of shallow marsh emergents in wetlands of the grassland and parkland regions of Saskatchewan occurred with greater than normal water depth at the start of the growing season. Two or more years of continuous flooding or repeated autumn reflooding were required to eliminate emergent cover completely. Changes in species composition occurred when basins were grazed and as vegetation reestablished after cultivation, but no change followed mowing or burning. Certain plants were designated 'disturbance' species on the basis of their response to soil exposure. Species composition of rooted submergents in a wetland can be used as a indicator of its moisture regime. Shallow marsh wetlands in basins of 1 ac (0.41 ha) or has experienced little year-long flooding and converted to open water only under atypical conditions. Larger wetlands required basin depths to excess of 36 in (96.4 cm) to have any amount of year-long flooding and to convert to open water. These basin size and depth criteria have applications in habitat evaluations by waterfowl managers. (Howard-Mass)
W79-03735

ROOT PRODUCTION AND ROOT TURNOVER IN A WET TUNDRA ECOSYSTEM, BARROW, ALASKA,
Duke Univ., Durham. Dept. of Botany.
G. R. Shaver, and W. D. Billings.
Ecology, Vol. 56, No. 2, p. 401-409, Early Spring, 1975. 8 fig, 4 tab, 22 ref.

Descriptors: *Tundra, *Root systems, *Rooted aquatic plants, *Biomass, *Turnovers, Plant growth, Wetlands, Productivity, Soil temperature, *Alaska, Ecology, Graminoids, Sedges.

Production of new roots by three species of graminoids in the wet tundra near Barrow, Alaska, was found to be strongly correlated with age of individual tillers, each species having a distinctive growth pattern and phenology. Root turnover rates also varied considerably with a range from an annual turnover to 6 to 8 (10) years. An estimate of root turnover on an ecosystem basis is about 100 g/sq m per year, or 25% of the live root biomass. Species with the shallowest and longest lived roots have the greatest weight per unit length of root, and vice versa. Each species has a characteristic root distribution pattern with depth and in relation to the progress of soil thaw. (Howard-Mass)
W79-03736

PRIMARY PRODUCTION AND LIFE HISTORY OF CAREX LACUSTRIS,
Ithaca Coll., NY. Dept. of Biology.
J. M. Bernard, and J. G. MacDonald, Jr.
Canadian Journal of Botany, Vol. 52, No. 1, p. 117-123, January, 1974. 7 fig, 1 tab, 17 ref.

Descriptors: *Freshwater marshes, *Rooted aquatic plants, *Productivity, *Standing crops, *Life history studies, Ecology, Marshes, Wetlands, Roots, *New York, Sedges.

In a Carex lacustris wetland, seasonal aboveground standing crops of 180 g/sq m in winter and 1037 g/sq m maximum in summer were determined. Seasonal aboveground production was estimated at 857 g/sq m per year with a maximum daily production of 15 g/sq m. A second estimate taking into account the high shoot mortality during the growing season provided values of 1580 g/sq m per year for seasonal aboveground production and 20.3 g/sq m for maximum daily production. Belowground standing crop was 387 g/sq m in winter and declined to an average summer low of 226 g/sq m. Belowground standing crop increased during autumn and, by October 7, a value equal to the previous winter's value was reached. Shoots of Carex lacustris live for one year or less, emerging in autumn, overwintering, and then dying during the next summer. (Howard-Mass)
W79-03737

COMPARATIVE GROWTH AND FOLIAR ELEMENT CONCENTRATIONS OF LARIX LARICINA OVER A RANGE OF WETLAND TYPES IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Botany.
D. L. Tilton.
Journal of Ecology, Vol 66, No 2, p 499-512, July, 1978. 3 fig, 7 tab, 44 ref.

Descriptors: *Wetlands, *Deciduous trees, *Plant growth, *Nutrients, *Soil-water-plant relationships, Fertility, Soil properties, Soil moisture, Soil types, Freshwater marshes, Marshes, Swamps, Bogs, Fen, *Minnesota, Nitrogen, Phosphorus, Magnesium, Manganese, Calcium.

Needle and lateral shoot length, stemwood radial increment and site index of Larix laricuna in Minnesota were lower in acid, nutrient-poor bogs than in circum-neutral, relatively nutrient-rich fens. Variation in these growth measures was positively correlated with foliar concentrations of N and, to a lesser extent, P. Nitrogen and P concentrations in the foliage were positively correlated with specific conductivity of the soil water at a site, and inversely correlated with site wetness. Foliar concentrations of Ca were also positively correlated with specific conductivity, while Mg concentrations in the foliage were positively correlated with soil water pH and specific conductivity. Manganese concentrations were inversely related to soil water pH. (Howard-Mass)
W79-03739

MORTALITY AND INITIAL PROPAGULE SIZE IN MANGROVE SEEDLINGS IN PANAMA,
Chicago Univ., IL. Dept. of Biophysics and Theoretical Biology.
D. Rabinowitz.
Journal of Ecology, Vol. 66, No 1, p 45-51, March, 1978. 3 fig, 2 tab, 17 ref

Descriptors: *Mangrove swamp, *Reproduction, *Mortality, *Size, Wetlands, Swamps, Brackish water, Longevity, Ecology, Age, Life cycle, *Panama.

The mortality rate of mangrove seedlings in Panama was inversely correlated with initial propagule size. The species with small propagules appear to establish new cohorts annually but die quickly, while those with larger propagules have over-lapping cohorts on the swamp floor
W79-03740

BREEDING BIRDS OF RIPARIAN WOODLAND IN SOUTH-CENTRAL ARIZONA,
Arizona State Univ., Tempe.
N. E. Stamp.
Condor, Vol. 80, p. 64-71, 1978. 3 fig, 3 tab, 24 ref.

Descriptors: *Birds, *Riparian land, *Habitats, *Vegetation effects, Riparian plants, Wetlands, Ecology, Cottonwoods, Mesquite, *Arizona, Ecological distribution.

Bird species diversity (BSD) of cottonwood and mesquite habitats of the Southwest appear to be correlated with foliage height diversity (FHD). For cottonwood habitats in Arizona, BSD was correlated with percent vegetative cover (PVC), a measure of foliage volume (FV). BSD was weakly correlated with FV, determined by the point-quarter method for riparian woodland habitats on the Verde River in Arizona. FHD, PVC and FV appear to be indefinite predictors of BSD. Breeding birds should be censused on study plots for consecutive years due to fluctuations in species diversity from year to year with seasonal measurements of habitat structure, fruit crops, and other resources to determine the relationship between vegetative structure and avian populations. (Howard-Mass)c
W79-03741

BIRDS AND MAMMALS OF SALT MARSHES AND SALT STEPPES IN SOUTHERN SLOVAKIA (CSSR),
Slovenska Akademie Vied, Bratislava (Czecholovakia). Ustav Biologie Kraniny.
For primary bibliographic entry see Field 2L.
W79-03744

AN ANALYSIS OF LAKE LEVEL INFLUENCE ON VEGETATION IN LAKE CHAMPLAIN,
Aquatec, Inc., South Burlington, VT.
For primary bibliographic entry see Field 2H
W79-03745

SUMMARY OF AVAILABLE INFORMATION ON CHESAPEAKE BAY SUBMERGED VEGETATION,
Maryland Univ., Cambridge. Horn Point Environmental Lab.
J. C. Stevenson, and N. M. Confer.
Fish and Wildlife Service, Office of Biological Sciences, FWS/OBS-78/66, August, 1978. 335, 50 fig, 88 tab, 747 ref.

Descriptors: *Submerged plants, *Bays, *Ecological distribution, Environmental effects, Aquatic plants, Estuaries, Pondweeds, Widgeon grass, Aquatic weeds, Rooted aquatic plants, Aquatic environment, Distribution patterns, Model studies, Publications, Plant ecology, Effluents, Wastes, Water pollution effects, Heavy metals

There are approximately eleven species of submerged aquatic vegetation (SAV) dominant in the wates of the Chesapeake Bay. These species tend to inhabit the shallow, shoreline areas of the Bay and its subestuaries, primarily limited to depths of three meters or less. Species vary as to salinity and temperature tolerances, morphology, preferred bottom substrate, susceptibility to chemical pollutants and general distribution. In order to determine the probable cause or cause for the changing patterns in submerged vegetation, the various factors that are known to affect the grasses have been analyzed to the extent possible given the availability of published and unpublished literature. Included among these factors are agrochemicals, turbidity, salinity, temperature, pH, wave action, fauna epiphytes, bicarbonate ion, chlorine, diseases, boat traffic, dredging, nutrient loading, petroleum and heavy metals. In order to assess these impacts and correlate them to a Baywide decline in submerged grasses, environmental factors can be initially separated into short-term, localized impacts or factors

that impact the Bay as a whole or on an aggregate basis such as the upper, middle, or lower Bay areas. Once the relative impacts of the known factors applicable to SAV growth and development have been analyzed, it becomes possible to apply mathematical modeling techniques to the Bay estuarine system. (Steiner-Mass)
W79-03746

SEASONAL IONIC FLUCTUATIONS IN A PHRAGMITES COMMUNIS COMMUNITY,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
I. L. Bayly, and T. A. O'Neill.
Canadian Journal of Botany, Vol. 50, No. 10, p. 2103-2109, 1972. 7 fig, 28 ref

Descriptors: *Marsh plants, *Nutrients, *Plant growth, Wetlands, Marshes, Calcium, Magnesium, Potassium, Sodium, Phosphorus, Grasses

Calcium, magnesium, potassium, sodium, and phosphorus concentrations were measured in the shoots of a phragmites communis community and its natural substrates during the growth season of 1969. Shoot length and shoot moisture were determined as indicators of physiological age. In addition, organic decay was followed by determination of the soil organic matter content and cation exchange capacity. Of the ions studied, calcium apparently increased in the shoot tissue, and magnesium, potassium, and phosphorus apparently decreased in the shoot tissue during the course of the growing season. Some speculations regarding the direction of net nutrient on flow in this community are advanced. (Steiner-Mass)
W79-03747

ECOSYSTEM AND MACROPHYTE PRIMARY PRODUCTION OF THE FORT RIVER, MASSACHUSETTS,
Amherst Coll., MA. Dept. of Biology.
S. G. Fisher, and S. R. Carpenter
Hydrobiologia, Vol. 49, No. 2, p. 175-187, May 31, 1976. 4 fig, 6 tab, 52 ref

Descriptors: *Aquatic plants, *Primary productivity, *Ecosystems, *Massachusetts, Rivers, Food webs, Decomposition, Streams, *Fort River(Mass)

Whole ecosystem gross primary production in the Fort River, measured using diurnal oxygen techniques, ranged from 0.44 g 02/sq m per day in winter to 6.50 g 02/sq m per day for 12 months. Mean ecosystem respiration was 3.65 g 02/sq m per day for 12 months. Macrophyte gross production (59.9 g 02/sq m per year) constitutes 9.2 percent of annual ecosystems productivity and 15.2 percent of summer primary production. Macrophytes were little grazed and entered food webs only after death, as detritus. Decomposition occurred near the site of production at relatively rapid rates, thus transport of dead macrophyte material in stream water was low. Data from this and other stream ecosystems suggest that, in general, streams are only moderately productive ecosystems which depend to varying degrees on watershed derived organic matter inputs. (Howard-Mass)
W79-03748

PHENOLOGY, DISTRIBUTION, AND SURVIVAL OF ATRIPLEX TRIANGULARIS WILLD. IN AN OHIO SALT PAN,
Ohio Univ., Athens. Dept. of Botany
K. A. McMahon, and I. A. Ungar
The American Midland Naturalist, Vol. 100, No. 1, p. 1-14, July, 1978. 4 fig, 7 tab, 33 ref

Descriptors: *Salt marshes, *Rooted aquatic plants, *Life history studies, *Ecological distribution, *Phenology, Saline soils, Soil moisture, Soil temperature, Wetlands, Ecology, *Ohio, Competition

Germination of Atriplex triangularis Willd. occurred between February and May in an Ohio salt pan. Flowers appeared in mid-July; seed development began in September. Senescence and death followed in late October. Soil Temperature of 15 degrees C appeared to trigger germination. High soil moisture values with consequent low soil salinity were prevalent during the genrmination period. Seedling establishment was particularly sensitive to salinity with severe mortality occurring in late spring and early summer when soil salinity began to climb. The highest concentration of soil salts coincided with the flowering stage in July and August when soil moisture values dropped severely due to low rainfall and high evaporation. By the seed development and maturation stage in September, soil moisture levels had begun to rise and total soil salts decreased. Of the four vegetation zones in the salt pan, germination and survival of A. triangularis were restricted in the main to the Atriplex zone. The establishment of A. triangularis in the Meadow and Hordeum zones was hindered by competition from other vegetation. High soil salinity within the Pan zone prevented germination of A. triangularis. (Howard-Mass)
W79-03749

ANNUAL METABOLISM OF A TEMPORARY POND ECOSYSTEM,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics
J. Cole, and S. G. Fisher
The American Midland Naturalist, Vol. 100, No. 1, p. 15-22, July, 1978. 3 fig, 1 tab, 25 ref

Descriptors: *Ponds, *Seasonal, *Productivity, *Rooted aquatic plants, Respiration, Wetlands, Ecology, Plankton, Aquatic plants, Aquatic animals, *Massachusetts, *Ecosystem, Ecology, Water level fluctuations, Water level, Metabolism

Whole ecosystem gross primary production and ecosystem respiration in Lost Pond, Massachusetts, estimated by diurnal oxygen techniques, were 2140 and 2669 kcal sq m per year, respectively. The plankton component represents only a small fraction of ecosystem metabolism. The benthic component, consisting of macrophytes, epiphytes, and sediment organisms, is the most active metabolic component of the ecosystem, particularly during the ice-free season. Macrophytes represent the major authochthonous organic matter input to Lost Pond. The fluctuating water level, by periodically exposing macrophytes, appears to exert a controlling influence on macrophyte decomposition and, therefore, may indirectly control the availability of certain nutrients in the water column. (Howard-Mass)
W79-03750

NUTRIENT AND WATER LEVELS IN A SMALL MICHIGAN BOG WITH HIGH TREE MORTALITY,
Michigan Univ., Pellston Biological Station
C. R. Schwintzer
The American Midland Naturalist, Vol. 100, No. 2, p. 441-451, October, 1978. 3 tab, 39 ref

Descriptors: *Bogs, *Nutrients, *Water levels, Wetlands, Ecology, *Michigan, Peat, Trees, Potassium, Nitrogen, Phosphorus, Calciu, Magnesium, Vegetation

Bryant's Bog consists of two concentric zones, a free-floating and a grounded mat surrounding a central pool. The vegetation of the two zones differed in species composition, biomass and extent of tree mortality from 1969-1975. The grounded mat had less biomass and more tree mortality. Midsummer values in 1974 and 1975 of 17 chemical and physical parameters of shallow groundwater (15-30 cm below the surface) were not significantly different (P greater than 0.05) between the two zones or the two summers. The shallow groundwater had the low Ca + Mg concentrations characteristic of ombrotrophic bogs, moderatley acid pH values characteristic of weakly minerotrophic bogs, and moderate concentrations of K, P and N. The ca + Mg and pH values were comparable to those in six other bogs in the area while K, P and N concentrations were noticeably higher in Bryant's Bog. The pattern of tree mortality was consistent with changes in water levels in lakes and streams in the region. Depth from the surface to the water level was significantly greater on the free than the grounded mat. Variations in water levels are the most probable cause of tree mortality and differences in vegetation of the two zones. (Howard-Mass)
W79-03751

THE EFFECTS OF DITCHING A SALT MARSH ON COLONY AND NEST SITE SELECTION BY HERRING GULLS (LARUS ARGENTATUS),
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
For primary bibliographic entry see Field 6G
W79-03752

MINERAL CONCENTRATIONS IN PAPYRUS IN VARIOUS AFRICAN SWAMPS,
Nairobi Univ. (Kenya). Dept. of Botany
J. J. Gaudet.
Journal of Ecology, Vol. 63, No. 2, p. 483-491, July, 1975. 1 fig, 8 tab, 12 ref.

Descriptors: *Swamps, *Environmental effects, *Nutrients, Wetlands, Marsh plants, Grasses, Distribution, Standing crop, Papyrus.

Papyrus swamps are generally located in areas of equatorial climate where winter-summer seasonal differences are small. But at the latitudinal limits of the present range of papyrus in Africa, winter and summer seasons become evident. Plants collected during the winter season north of the equator at Lake Tana in Ethiopia, and south of the equator on the Shire River in Malawi contain lower levels of most elements. Standing crop could well be lower for papyrus populations in such regions, and this in turn might affect the level of nutrient uptake. The mean mineral concentrations and range in concentration in papyrus are like those of other swamp emergents in that they are low compared to other aquatics. (Steiner-MAss)
W79-03753

THE RELATIONSHIP BETWEEN STANDING CROP IN SEDGE MEADOWS AND SUMMER TEMPERATURE,
Minnesota Univ., Minneapolis. Dept. of Botany
E. Gorham
Journal of Ecology, Vol. 62, No. 2, p. 487-491, July, 1974. 1 fig, 1 tab, 15 ref.

Descriptors: *Marsh plants, *Standing crop, *Temperature, Wetlands, Growth rate, Heat, Seasonal, Summer, Productivity, Marshes

Despite low values in extreme northern and montane sites, sedge standing crop is not significantly correlated with length of growing season. It is, however, closely correlated with the highest monthly mean temperature. Carex bigelowii at 1840 m on Mt. Washington experienced about 26 degree-days to reach a peak standing crop of about 180 g/sq m in midsummer. C. rostrata at 1455 m in the Canadian Rockies experienced about 68 degree-days to reach a midsummer peak of about 750 g/sq m, whereas C. rostrata in Minnesota experienced about 1290 degree-days to reach about 1100 g/sq m in midsummer. The highly productive stand of C. lacustris in New York State experienced about 1770 degree-days to peak at 1470 g/sq m in mid-September. There is a strong correlation, therefore, between standing crop and heat-unit accumulations, despite the limitations of the heat-unit concept. (Steiner-Mass)
W79-03754

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
J. G. McColl, and J. Burger
The American Midland Naturalist, Vol. 96, No. 2, p. 270-280, October, 1976. 2 fig, 4 tab, 23 ref.

Descriptors: *Freshwater marshes, *Cattails, *Nutrients, *Gulls, Life cycles, Ecology, Marshes, Wetlands, Nitrogen, Potassium, Sodium, Magne-

sium, Calcium, Sediments, Rooted aquatic plants, Wildlife.

Large increases occurred in N and P concentrations of water in the immediate vicinity of a nesting Franklin's gull colony in Agassiz Natonal Wildlife Refuge, Minnesota. Peak concentrations were concomitant with the peak of gull nestbuilding and feeding activities in mid-May and mid-July. About 36% of the annual P input to the pool with the gull colony is attributable to the gulls. Nutrient concentraton in inflow and outlet water of both the pool with a gull colony and one without remained relatively constant throughout the year due to nutrient absorption by the pool sediments. The gull colony had little effect on the concentrations of Na, K, Ca, and Mg in water. Outlet waters of both pools had higher K concentrations than inputs due to release of the element by the sediments to water or by nutrient uptake by cattails and subsequent leaching of both dead and living cattails. Most nutrients accumulated in the sediments, especially in the pool with the gull colony. Most nutrients accumulated in the sediments, especially in the pool with the gull colony. The Refuge acts as a sink for nutrients in runoff from surrounding agricultural land. (Howard-Mass)
W79-03755

HABITAT SELECTION BY WATERFOWL OF ARGENTINE ISLA GRANDE,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
M. W. Weller.
Wilson Bulletin, Vol. 87, No. 1, p. 83-90, March, 1975. 1 fig, 1 tab, 13 ref.

Descriptors: *Waterfowl, *Habitats, *South America, Ducks, Geese, Swans, Marshes, Estuaries, Lakes, Broods, Wetlands, *Argentine Isla Grande.

During a month-long study of habitat selection and of seeding behavior of waterfowl, 15 of the 17 species of waterfowl known to occur on the island were seen. Habitat segregation of breeding waterfowl was quite distinctive and resembled the pattern of the same species in the Falkland Islands. Different species of Sheldgeese, associated with various habitat types including exposed rocky seashore, shortgrass meadows in open or semiwooded country, and streams and lakes in densely wooded areas, during the breeding season, are a good example of presumed ecological isolation. In estuarine areas, steamer ducks, which feed by diving, have little overlap in food use with dabbling ducks of the genus Anas. Dabbling ducks overlapped most in freshwater marshes but, even there, seemed to be segregated by feeding sites and feeding behavior. (Howard-Mass)
W79-03756

PRIMARY PRODUCTION IN THE FRESHWATER MARSH ECOSYSTEM OF TROY MEADOWS, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-03758

PRODUCTION, NUTRIENT CONTENT AND DECOMPOSITION OF PHRAGMITES COMMUNIS TRIN. AND TYPHA ANGUSTIFOLIA L.,
University of East Anglia, Norwich (England) School of Biological Sciences.
F. F. Mason, and R. J. Bryant
Journal of Ecology, Vol 63, No 1, p 71-95, March, 1975 5 fig, 12 tab, 45 ref, 1 append

Descriptors: *Freshwater marshes, *Productivity, *Nutrients, *Decomposing organic matter, Cattails, Reeds, Wetlands, Swamps, Marshes, Eutrophication, Europe, Rooted aquatic plants, Aquatic plants.

Shoots of Phragmites and Typha emerged in April in reedswamps at Alderfen Borad, Norfolk. The peak shoot density of Phragmites, occurring in July, was 127 sq m in 1972 but decreased to 72/sq m the following year due largely to grazing by coypus. Loss of dead standing shoots occurred mainly in the spring and summer--some dead shoots surviving for over two years. Typha shoots reached a maximum density of 100/sq m in May 1973 and thereafter declined steadily through a self-thinning process. The peak standing crop of Phragmites was 942 g dry wt/sq m in 1972 and 524 g/sq m in 1973 and that of Typha 1118/sq m in 1973. The net productivity was estimated as 1080 g/sq m and 551 g/sq m in the two years for Phragmites and 1445 g/sq m for Typha in 1973. Growing shoots of Phragmites and Typha showed marked, and different, seasonal changes in nutrient content; seasonal changes in rhizomes were also detected. Phragmites decomposed at a faster rate than Typha. The reedswamp released large amounts of nutrients into Alderfen Broad during the winter. (Howard-Mass)
W79-03759

AN INVESTIGATION OF THE BIOTIC FACTORS DETERMINING THE RATES OF PLANT DECOMPOSITION ON BLANKET BOG,
Durham Univ. (England). Dept. of Zoology.
J. C. Coulson, and J. Butterfield.
Journal of Ecology, Vol. 66, No. 2, p. 631-650, July, 1978. 15 tab, 16 ref.

Descriptors: *Bogs, *Peat, *Decomposing organic matter, Rates, *Soil types, Organic matter, Wetlands, Ecology, Aquatic plants, Microbial degradation, Soil micro-organisms, Invertebrates, Insects, Nutrients, Nitrogen, Phosphorus, Fertilization, Europe.

The chemical composition of a plant species is of paramount importance in determining the rate of its decomposition on blanket bog in the northern Pennines. Peat accumulation is primarily the result of the intrinsic slow decay rate of some of the species in the plant community. The average rate of microbial decomposition of the same substrates was similar at peat and at mineral soil sites. The role of animals in the decomposition of plant materials differed markedly according to both the soil type and the plant species of the substrate. The decomposition losses attributed to microorganisms and to animals were not significantly correlated. Compared to mineral soils, peat contained a lower overall density of soil animals. The rates of microbial decomposition were highly correlated with the plant P or N concentration on both soil types. When animal contribution to decomposition was included this correlation became nonsignificant on the peat. Plant material enriched with N showed increased decomposition rates while that enriched with P did not. (Howard-Mass)
W79-03760

GEOGRAPHICAL VARIATION IN BRITISH SALTMARSH VEGETATION,
Cambridge Univ. (England). Botany School.
P. Adam.
Journal of Ecology, Vol. 66, No. 2, p. 339-366, July, 1978. 5 fig, 94 ref, 2 append

Descriptors: *Salt marshes, *Vegetation, Regions, Europe, Marshes, Wetlands, Ecology, Plant populations, Ecological distribution, Aquatic plants.

Three types of saltmarshes around the British coast were recognized from cluster analysis and principal coordinates analysis of the noda occurring at 133 marsh sites. One type is largely restricted to south-east England and at present is normally ungrazed. A second type is largely restricted to the Irish Sea coast of England and Wales and most examples are grazed. The third type is characteristics of loch-head marshes on the west coast of Scotland. It is suggested that the saltmarsh types have arisen through the interaction of sediment type, climatic, biotic and historic factors. Of these, the most important determinant of the vegetation types on saltmarshes in England and Wales is past and present land use. A regional differentiation of saltmarsh vegetation into four major 'natural' types is postulated. (Howard-Mass)
W79-03761

ALGAE IN CULTURE AND NATURE,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W79-03843

2J. Erosion and Sedimentation

RETARDATION OF SEDIMENT PHOSPHORUS RELEASE BY FLY ASH APPLICATION,
Notre Dame Univ., IN
For primary bibliographic entry see Field 5C.
W79-03560

SCOUR AND FILL PATTERNS IN POOL-RAPID RIVERS,
Arizona Univ. Tucson. Dept. of Civil Engineering and Engineering Mechanics.
E. Silverston.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 584. Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 85p, 36 fig, 1 tab, 7 ref, append. OWRT A-038-ARIZ(1), 14-31-0001-4003.

Descriptors: Degradation, Erosion, *Scour, Rivers, River flow, Sediments, *Sediment transport, *Distribution patterns, River behavior, Stream morphology

Sediment carrying pool-rapid rivers are abundant in the United States. However, not much is known about the behavior of the pool beds. It is known that with an increase in the flow that sediment eventually is scoured from the bed and when the flow is decreased the bed elevation eventually increases, but what actually occurs before the final equilibrium bed configuration is attained can only be approximated. It is a reasonable assumption that the bed elevation fluctuates due to scour and deposition, until the final equilibrium bed configuration is attained. An approximate analysis of the scour and fill patterns of the pool-rapid river was made to predict the scour and fill patterns of pool-rapid rivers. A numerical model was analyzed to better account for what actually happens to the pools. The results of the analysis verified that when there was a change in the flow that the pool bed had fluctuated by scouring or filling, and that the time period until equilibrium would occur varied by several orders of magnitude.
W79-03668

TRANSPORT OF A NONCOHESIVE SANDY MIXTURE IN RAINFALL AND RUNOFF EXPERIMENTS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia)
P. H. Walker, P. I. A. Kinnell, and P. Green
Soil Science Society of America Journal, Vol. 42, No. 5, p 793-801, September-October 1978. 8 fig, 3 tab, 20 ref

Descriptors: *Impact(Rainfall), *Soil erosion, *Bed load, *Suspended solids, Erosion, Laboratory tests, Simulated rainfall, Particle size, Rainfall, Runoff, Erosion, Soils, Sands, Sediment transport, Flow, Storms, Precipitation(Atmospheric), Soil science

Rainfall intensities of 45, 100, and 150 mm/hr with systematically varied kinetic energies were applied to a saturated noncohesive, sandy bed 3 m long and set at slopes of 0.5 and 5%. Detailed size analyses of solids discharged showed that the less than 31-micrometer fraction was mobilized most readily and behaved as a suspended load; the 31- to 250-micrometer fraction was transported slowly, much apparently as saltating bed load; the 0.25- to 4-mm fraction was transported rapidly, grains tending to move as rolling bed load; the greater than 4-mm fraction behaved as a lag gravel. The sedimentary properties of deposits described the differentiation of various size fractions and minerals in the original mixture. The results showed raindrop impacts within the flow were important in promoting transport of solids than the aerial component of splash. Under conditions where overland flow had developed, transport of

solids was related directly to rainfall intensity and variations in rainfall energy that were associated with variations in raindrop impact frequency. Increases in rainfall energy due to increasing raindrop sizes did not result in increases in solids discharged. (Sims-ISWS)
W79-03804

THEORETICAL MODEL OF THE LITTORAL DRIFT SYSTEM IN THE TORONTO WATERFRONT AREA, LAKE ONTARIO,
Scarborough Coll., Toronto (Ontario).
For primary bibliographic entry see Field 2H.
W79-03811

POLYCHLORINATED BIPHENYLS: ACCUMULATION FROM CONTAMINATED SEDIMENTS AND WATER BY THE POLYCHAETE NEREIS DIVERSICOLOR.
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum
For primary bibliographic entry see Field 5C.
W79-03904

EFFECTS OF SEDIMENTS ON THE DEVELOPMENT OF MACROCYSTIS PYRIFERA GAMETOPHYTES,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5C
W79-03905

SAND AND GRAVEL OFFSHORE IN THE GREATER NEW YORK METROPOLITAN AREA: WHAT KIND AND HOW MUCH,
New York Sea Grant Inst., Albany
For primary bibliographic entry see Field 2L.
W79-03963

WIND EROSION AND DEPOSITION ALONG A COASTAL SAND DUNE,
Delaware Univ., Newark. Coll. of Marine Studies.
R. J. Lai, and J. Wu
Sea Grant Technical Report No. DEL-SG-10-78, September 1978. 31 p, 9 fig, 17 ref.

Descriptors: *Erosion, *Deposition(Sediments), *Dunes, *Wind erosion, Sediment transport, Coasts, Laboratory tests, Wind force.

When wind blows over a coastal dune, the effective wind force and sand-transport rate vary significantly along the surface of the dune. Erosion and deposition of sand along the dune surface depend on dynamic wind force, local dune geometry, and sand-grain size. These parameters have been studied from laboratory modeling and numerical calculation. The results indicate that erosion depends strongly on wind velocity and local slope of the dune surface. Furthermore, while it affects only slightly the total sand transport rate from the dune, the size of the sand grains significantly affects the distribution of the transport rate and, consequently, the erosion and deposition areas along the dune. (NOAA)
W79-03965

2K. Chemical Processes

ALIPHATIC ACID ANIONS IN OIL-FIELD WATERS--IMPLICATIONS FOR ORIGIN OF NATURAL GAS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 1A.
W79-03558

CYCLIC WETTING AND DRYING OF THE SOIL ZONE AS AN INFLUENCE ON THE CHEMISTRY OF GROUND WATER IN ARID TERRAINS,
Wyoming Univ., Laramie. Dept. of Geology; and Geological Survey, Denver, CO. Geologic Div.
J. I. Drever, and C. L. Smith
American Journal of Science, Vol 278, p 1448-1454, December 1978. 6 fig, 1 tab, 8 ref.

Descriptors: *Chemical reactions, *Soil water, *Wetting, *Drying, *Arid lands, Rainfall, Cloudbursts, Saline soils, Solutes, Evaporation, Salts, Laboratory tests, Analytical techniques, Leaching, Groundwater, Springs, *Re-solution of salts.

In arid climates, occasional heavy rains cause partial re-solution of salts deposited in the soil and vadose zone. The kinetics of re-solution of these salts were studied in the laboratory by evaporating waters of different composition in a sand tray and then leaching the sand with distilled water. The relative rates of dissolution were Na and Cl most rapid, the K, SO_4, Mg, Ca, carbonate species and finally SiO_2. Processes of evaporation followed by re-solution can give rise to a solution composition depleted in SO_4, Mg, and SiO_2 relative to chloride, even though the solution is undersaturated with respect to minerals containing these elements. The process explains well the chemistry of springs in the Teels Marsh Basin, Nev., and may complicate mass balance calculations relating water chemistry to rock weathering. (Woodard-USGS)
W79-03584

PARAQUAT SORPTION AS A FUNCTION OF PARTICLE SIZE IN NATURAL SEDIMENTS,
Environmental Research Lab., Athens, GA
For primary bibliographic entry see Field 5B
W79-03595

NITRATE ACCUMULATION IN SOILS AND LOSS IN TILE DRAINAGE FOLLOWING NITROGEN APPLICATIONS TO CONTINUOUS CORN,
Minnesota Agricultural Experiment Station, St. Paul.
R. G. Gast, W. W. Nelson, and G. W. Randall
Journal of Environmental Quality, Vol. 7, No. 2, p 258-261, April-June, 1978. 1 fig, 4 tab, 9 ref.

Descriptors: *Nutrient removal, *Denitrification, Nitrates, *Tile drainage, Water pollution, Sweet corn.

Nitrate-N concentration in tile water, loss from tile lines, and accumulation in soil profiles were determined following each of three annual applications of 20, 112, 224, and 448 kg N/ha to continuous corn (Zea mays L.) grown on a Webster clay loam (Typic Haplaquoll) in southern Minnesota. Plots were isolated to a depth of 1.8 m with plastic to allow an accurate assessment of the area drained. There was relatively little increased NO_3-N accumulation in the soil profile or loss from tile lines at the recommended application rate of 112 kg N/ha compared to that for the check treatment. Nitrate-N losses through tile lines in 1975 (after 3 years treatment) were 19, 25, 59, and 120 kg/ha for the 20, 112, 224, and 448 kg N/ha applications, respectively, which had NO_3-N accumulations in the 0-3 m soil profiles of 54, 100, 426, and 770 kg NO_3-N/ha. Maximum NO_3-N accumulation in the soil profiles occurred at a depth of about 1 m with little evidence of movement below about 2.2 m. (Skogerboe-Colorado State)
W79-03653

THE EFFECT OF HIGH 2, 4-D CONCENTRATIONS ON DEGRADATION AND CARBON DIOXIDE EVOLUTION IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science; and Florida Univ., Gainesville. Dept. of Food Science and Human Nutrition
For primary bibliographic entry see Field 5B
W79-03678

EFFECTS OF TRACE ELEMENTS ON NITRIFICATION IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy
For primary bibliographic entry see Field 5A
W79-03705

A GEOCHEMICAL STUDY OF A MARSH ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, MS.
T. F. Lytle, J. S. Lytle, and P. L. Parker.
Gulf Coast Research Reports, Vol. 4, No. 2, p. 214-232, November, 1973. 6 fig, 5 tab, 17 ref.

Descriptors: *Marsh plants, *Salt marshes, *Trace metals, *Geochemistry, Wetlands, Marshes, Sediments, Metals, Organic matter, Gulf Coastal Plain, Soil contamination, Water pollution, Pollutant identification, Bioassay, Indicators, Soil analysis.

The marsh plants as a whole have exhibited an ability about as strong as terrestrial and marine plants in accumulating a variety of trace metals from their environment. In some cases the marsh plants may act as sources for trace metal enrichment in the sediments and in other instances, notably molybdenum, as an active depleting agent. The coastal marsh environment widespread among Gulf and Atlantic coastlines will undoubtedly continue to be a primary target of heavy metal pollution. The varying degrees of enrichment of the various elements both essential and nonessential in marsh plants should make them of value in establishing base-line evaluations of heavy metal inventories in a coastal area. (Steiner-Mass)
W79-03743

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 2I
W79-03755

DETERMINATION OF PHOSPHATE BY CATHODIC STRIPPING CHRONOPOTENTIOMETRY AT A COPPER ELECTRODE,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry
For primary bibliographic entry see Field 5A.
W79-03769

VOLTAMMETRIC DETERMINATION OF TRACE QUANTITIES OF NITRATE IN AN ANION EXCHANGE MEMBRANE ISOLATED CELL,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry
For primary bibliographic entry see Field 5A.
W79-03771

CHEMICAL CHARACTERIZATION OF THE GASEOUS AND LIQUID ENVIRONMENTS OF SUBSURFACE DRAIN SYSTEMS,
Agricultural Research Service, Brawley, CA. Imperial Valley Conservation Research Center.
B. D. Meek, L. B. Grass, and A. J. MacKenzie
Soil Science Society of American Journal, Vol. 42, No. 5, p. 693-698, September-October 1978. 3 fig, 6 tab, 14 ref.

Descriptors: *Subsurface drains, *Chemical precipitation, *On-site investigations, Solutes, Gases, Soil gases, Drainage systems, Tile drains, Tiles, Iron, Manganese, Chemicals, Oxygen, Dissolved oxygen, Carbon dioxide, Oxidation-reduction potential, Chemistry, Water chemistry, California, *Imperial Valley(CA).

Chemical composition of subsurface drain effluent was determined in the field as a function of location (various depths and soil textures), entry point of the solution into the drainpipe, and distance from outlet (with or without a water trap). Liquid samples were analyzed for Fe, Mn, NO_3-N, HCO_3, organic carbon, electrical conductivity, pH, and dissolved oxygen, and gas samples were analyzed for O_2 and CO_2. Manganese ranged from less than 0.1 to 6.1 ppm and Fe ranged from less than 0.1 to 14.2 ppm which illustrated the wide range of oxidation-reduction conditions present in the soils drained by subsurface drain lines. Chemical composition changed little during the season. Water entering the upper portion of the drain line was lower in Mn, which was the result of shor

flow paths through soil zones with higher O2 levels, than the water moving through longer flowlines which entered the bottom of the drains. The solutions in the drain lines were undersaturated with respect to the drain line atmosphere, which indicated that O2 flows downward through the drain trench backfill. This is an important factor in the oxidation of Fe and Mn in subsurface drain lines. However, longitudinal movement of O2 into drain lines, via the outlets, is a minor factor contributing to the precipitation of Fe and Mn and does not account for the extensive amount of precipitation of Fe or Mn within the drain system. (Sims-ISWS)
W79-03801

SAMPLING OF GROUNDWATERS FOR CHEMICAL ANALYSIS,
Alberta Research Council, Edmonton. Groundwater Div.
E. Wallick.
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 19-30, 1977. 11 fig, 2 tab, 7 ref.

Descriptors: *Sampling, *Water chemistry, *Chemical analysis, *Groundwater, Surveys, Wells, Water wells, Chemicals, Headness(Water), Alkalinity, Iron, Silicates, Carbonates, Hydrogen ion concentration, Chemistry, Chemical reactions, Analytical techniques, Hydrogeology, Groundwater sampling.

Groundwater chemical systems are often unstable when exposed to surface conditions, so incorrect values for certain chemical parameters may result when samples are analyzed. Determination of the equilibrium chemical state of groundwater from the thermo-dynamic constants requires that input ionic concentrations be representative of field pressure and temperature conditions. Test samples from east-central Alberta showed that low values for hardness, alkalinity, and total iron were obtained if no attempt was made to preserve the samples. It was found that by collecting three samples, one untreated, one acidified to pH = 1 for laboratory analysis, and one untreated to field analysis of pH, temperature and conductivity, accurate determination of chemical components could be made. (See also W79-03819)(Sims-ISWS)
W79-03822

MINERALIZATION, IMMOBILIZATION AND NITRIFICATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
F. E. Broadbent.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 109-134, 1978. 5 fig, 33 ref.

Descriptors: Nitrogen, *Nitrification, Ammonia, Decomposing organic matter, Soil microorganism, Inorganic compounds, Pollutants, Inhibitors, *Mineralogy.

The decomposition of organic substances containing nitrogen through the activities of soil microorganisms and resulting in the release of some of the nitrogen as ammonia is called nitrogen mineralization. Net mineralization occurs when the quantity of nitrogen in the material undergoing decomposition exceeds the needs of the microbial population for nitrogen to produce new cells. If the decomposing substances do not contain enough nitrogen to meet the needs of the microbial population, any inorganic nitrogen present in the soil will be utilized by the microbes and converted to cell protein and other nitrogenous compounds. This process is called immobilization. In a sense the assimilation of inorganic nitrogen by growing plants is also immobilization, but this discussion considers only the microbiological process. The nitrogen supplying capacity of soils depends to a large extent on rates of mineralization and immobilization. Various procedures have been utilized to obtain estimates of nitrogen mineralization over a growing season, the most successful of which have been based on incubation of soil samples under controlled conditions for a few weeks. Desirable management practices should favor not only efficient utilization of fertilizer nitrogen, but also maximum crop uptake of mineralized nitrogen. Experiments with isotopically labeled fertilizers indicate that these two objectives are compatible with each other and also with the need to minimize leachable nitrate. (See also W79-03941) (Skogerboe-Colorado State)
W79-03945

COUPLING PHENOMENA IN SATURATED HOMO-IONIC MONTMORILLONITE: III. ANALYSIS,
Guelp Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2G.
W79-03962

ARSENIC DETERMINATION BY THE SILVER DIETHYLDITHIOCARBAMATE METHOD AND THE ELIMINATION OF METAL ION INTERFERENCE,
Claflin Coll., Orangeburg, SC.
For primary bibliographic entry see Field 5A.
W79-03982

PROCEEDINGS OF THE SECOND WORKSHOP ON SAMPLING GEOTHERMAL EFFLUENTS.
For primary bibliographic entry see Field 5A.
W79-03987

2L. Estuaries

STIRRING INFLUENCES THE PHYTOPLANKTON SPECIES COMPOSITION WITHIN ENCLOSED COLUMNS OF COASTAL SEA WATER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W79-03512

MONTHLY OXYGEN AND CARBON BUDGETS OF THE NEW YORK BIGHT APEX,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 5B.
W79-03555

WORKSHOP ON COPPER IN ESTUARINE, CONTINENTAL AND MARINE WATERS.
Department of Energy, Washington, DC. Div of Biomedical and Environmental Research.
For primary bibliographic entry see Field 5C.
W79-03564

THE EFFECT OF COMPETITION AND SALINITY ON THE GROWTH OF A SALT MARSH PLANT SPECIES,
California Univ., Davis. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03634

DYNAMIC MODEL OF NUTRIFICATION IN HUNTINGTON BAY, NEW YORK,
Long Island Univ., Greenvale, NY. Dept. of Marine and Environmental Science.
For primary bibliographic entry see Field 5B.
W79-03638

POLYCHLORINATED BIPHENYL (PCB) EFFECTS ON MARINE PHYTOPLANKTON PHOTOSYNTHESIS AND CELL DIVISION,
Stanford Univ., Pacific Grove, CA. Hopkins Marine Station.
For primary bibliographic entry see Field 5C
W79-03650

ENHANCEMENT OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) BY LAKE FERTILIZATION IN GREAT CENTRAL LAKE: SUMMARY REPORT,
Fisheries and Marine Service, Nanaimo (British Columbia). Pacific Biological Station.
For primary bibliographic entry see Field 5C.
W79-03658

CONTRIBUTED PAPERS ON COASTAL ECOLOGICAL CHARACTERIZATION STUDIES, FOURTH BIENNIAL INTERNATIONAL ESTUARINE RESEARCH FEDERATION CONFERENCE, OCTOBER, 1977.
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
Report FWS/OBS-77/37, April, 1978. 66 p.

Descriptors: *Systems analysis, *Estuaries, *Model studies, *Coasts, Coastal plains, Ecology, Ecosystems, Wetlands, Management, Marsh management.

Six papers present, discuss, and give examples of the U. S. Fish and Wildlife Service's coastal ecological characterization. An ecological characterization is a description of the important components and processes of an ecosystem with an emphasis on the understanding of functional relationships. Characterizations will be available for use by all FWS programs related to coastal resource management and planning. Other applications are assessing the Outer Continental Shelf development, Coastal Zone Management, and Section 208 water quality planning. Characterizations will identify fish and wildlife populations and their habitats that could be impacted during ecological emergencies such as oil spills. (See W79-03698 thru W79-03703) (Steiner-Mass)
W79-03697

COASTAL ECOLOGICAL CHARACTERIZATION-AN OVERVIEW,
National Coastal Ecosystems Team, NSTL Station, MS.
J. B. Johnston.
In: Contributed Papers on Coastal Ecological Characterization Studies, Fourth Biennial International EStuarine Research Federation Conference, October, 1977. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-77/37, April, 1978. p 1-3.

Descriptors: *Coastal plains, *Ecosystems, *Systems analysis, Coasts, Structural models, Structure, Ecology, Hydrology, Land management, Productivity, Simulation analysis, Estuaries

The U.S. Fish and Wildlife Service, in response to accelerated development pressures upon the coastal zone of the United States and its territories, has developed an ecological characterization approach for describing these valuable areas. Characterizations integrate functionally the major elements of an ecosystem. Elements include, but are not limited to, physiography and geology, climate, and physical transport mechanisms. Examples of physical transport mechanisms are hydrology, sediment flux, physical oceanography, energy flows and trophic relationships, and atmospheric transport. Characterizations describe the important species, populations, and communities in the ecosystem, with particular emphasis on those organisms perceived as being of importance (recreational or commercial) to man or vital to the natural functioning of the ecosystem being studied. Population estimates do not require precise statistical sampling, but where feasible, estimates are to address the extent and causes of natural variation. The main objective of a characterization is to describe socio-economic, physical, and biological features as interacting components, thereby establishing a foundation upon which impacts of man, including modifications to the ecosystem, can be predicted. (See also W79-03697)(Steiner-Mass)
W79-03698

ECOSYSTEM CHARACTERIZATION-AN APPROACH TO COASTAL PLANNING AND MANAGEMENT,
Fish and Wildlife Service, Washington, DC. Office of Biological Services

For primary bibliographic entry see Field 6A.
W79-03699

EVALUATION OF METHODOLOGY USED IN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN,
National Coastal Ecosystems Team, NSTL Station, MS.
For primary bibliographic entry see Field 6B
W79-03700

USER-ORIENTED CONCEPTUAL MODELING IN THE ECOLOGICAL CHARACTERIZATION OF THE SEA ISLANDS AND COASTAL PLAIN OF SOUTH CAROLINA AND GEORGIA,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
For primary bibliographic entry see Field 6A.
W79-03701

MAINE COAST CHARACTERIZATION USER'S GUIDE,
Energy Resources Co., Inc., Cambridge, MA.
S. J. Feier, C. Laffin, J. Thornton, P. Schettig, and R. Bran.
In: Contributed Paper on Coastal Ecological Characterization Studies, October, 1977. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-77/37, p. 44-66, April, 1978. 12 fig, 4 tab, 13 ref.

Descriptors: *Model studies, *Systems analysis, *Estuaries, Coasts, Coastal plains, Ecology, Ecosystems, Design, Wetlands, *Maine.

The user's guide is part of the Maine Coast Ecological Characterization that will be completed in late 1979. It directs various users on how to manipulate the materials in the characterization to satisfy their specific needs. (See also W79-03697) (Steiner-Mass)
W79-03703

ROOT PRODUCTION AND ROOT TURNOVER IN A WET TUNDRA ECOSYSTEM, BARROW, ALASKA,
Duke Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-03736

MICROBIAL POPULATIONS IN FLOODED SWAMP SOILS OF SOUTH CAROLINA,
Southeastern Forest Experiment Station, Asheville, NC.
For primary bibliographic entry see Field 2G.
W79-03742

A GEOCHEMICAL STUDY OF A MARSH ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2K.
W79-03743

BIRDS AND MAMMALS OF SALT MARSHES AND SALT STEPPES IN SOUTHERN SLOVAKIA (CSSR),
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Biologie Krainy.
F. J. Turcek.
Biological Conservation, Vol. 9, No. 1, p. 29-36, January, 1976. 3 fig, 5 tab, 7 ref.

Descriptors: *Salt marshes, *Wildlife habitat, *Saline soils, Wetlands, Birds, Mammals, Land use, Water pollution, Wildlife management.

Saline marshes and steppes along the Danube in southern Slovakia lie on the northern-most border of the complex of Central American saline soil. The ecology of the saline localities studied is outlined on the basis of 48 bird and 18 mammal species. Some birds are confined to the saline localities studied because they are relatively well conserved and extensive rather than because they are saline. The root vole, Microtus oeconomus, known only from the area studied, and the lizard Lacerta vivipara, living in isolated populations in mountainous areas, are the only known vertebrate relics. Some functional aspects of the animals studied are stressed. The saline localities are threatened by reclamation for agricultural use, by fire, drainage and lowering the underground water table, but primarily by pollution from both oily water and the dumping of reuse. (Steiner-Mass)
W79-03744

SUMMARY OF AVAILABLE INFORMATION ON CHESAPEAKE BAY SUBMERGED VEGETATION,
Maryland Univ., Cambridge. Horn Point Environmental Lab.
For primary bibliographic entry see Field 2I.
W79-03746

SEASONAL IONIC FLUCTUATIONS IN A PHRAGMITES COMMUNIS COMMUNITY,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-03747

HABITAT SELECTION BY WATERFOWL OF ARGENTINE ISLA GRANDE,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 2I.
W79-03756

GEOGRAPHICAL VARIATION IN BRITISH SALTMARSH VEGETATION,
Cambridge Univ. (England). Botany School.
For primary bibliographic entry see Field 2I.
W79-03761

THE COMMUNITY STRUCTURE OF A TROPICAL MARINE LAGOON,
Dade County of Environmental Resources Management, Miami, FL.
R. F. Holm.
Estuarine and Coastal Marine Science, Vol. 7, No. 4, p. 329-345, October 1978. 9 fig, 4 tab, 44 ref.

Descriptors: *Lagoons, *Tropical regions, *Florida, *Biological communities, On-site investigations, Benthos, Benthic fauna, Phytoplankton, Tidal waters, Sediments, Sampling, Organic matter, Vegetation, Coasts, Shores, *Florida Keys, *Biscayne Bay(FL).

The structure of the benthic community in a nearshore tropical marine lagoon, in the upper Florida Keys, was examined in early spring and midsummer in 1973 and 1974. Eight environmental parameters (water depth, tidal range, current flow, water temperature, salinity, pH, sediment depth, and particle size) were monitored. The biota was compared along an intertidal-subtidal environmental gradient. The amount of vegetation present and the stability of the sediment modified the abundance and diversity of the benthic macrofauna. The results of this study were compared with those from other areas in the tropical Western Atlantic Ocean. The uniqueness of the lagunar environment made it possible to examine the changes in species abundance and diversity as a detritus-based food web graded into a phytoplankton based-food web. (Sims-ISWS)
W79-03817

IMPACT OF NEARSHORE DEVELOPMENT ON OPEN COASTAL RESOURCES,
Southern California Coastal Water Research Project, El Segundo, CA.
For primary bibliographic entry see Field 5C.
W79-03829

SYMPOSIUM: EXPERIMENTAL USE OF ALGAL CULTURES IN LIMNOLOGY; SANDEFJORD, NORWAY, 26-28 OCTOBER 1976,
Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Stuttgart (Germany, F.R.).
For primary bibliographic entry see Field 5C.
W79-03842

EFFECTS OF RIVER DISCHARGE ON THE COASTAL PHYTOPLANKTON CYCLE,
Norwegian Fisheries Directoriate, Arendal, Statens Biological Station.
For primary bibliographic entry see Field 5C.
W79-03873

GROWTH EXPERIMENTS WITH MARINE PLANKTON ALGAE: THE ROLE OF 'WATER QUALITY' IN SPECIES SUCCESSION,
Oslo Univ. (Norway). Dept. of Marine Biology and Limnology.
For primary bibliographic entry see Field 5C.
W79-03888

ALGAL TESTS USED TO STUDY THE CHEMICAL FACTORS REGULATING THE GROWTH OF PLANKTONIC ALGAE IN THE HELSINKI SEA AREA,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
For primary bibliographic entry see Field 5A.
W79-03889

CHANGES IN SUCCESSION RATE IN A NATURAL PHYTOPLANKTON COMMUNITY FOLLOWING NUTRIENT ENRICHMENT,
Stockholm Univ. (Sweden). Inst. of Botany.
For primary bibliographic entry see Field 5C.
W79-03894

A STEADY-STATE PHYTOPLANKTON MODEL OF CHESAPEAKE BAY,
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W79-03899

POLYCHLORINATED BIPHENYL (PCB) UPTAKE BY MARINE PHYTOPLANKTON,
Stanford Univ., Pacific Grove, CA. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W79-03903

SAND AND GRAVEL OFFSHORE IN THE GREATER NEW YORK METROPOLITAN AREA: WHAT KIND AND HOW MUCH,
New York Sea Grant Inst., Albany.
D. Carlisle, and W. A. Wallace.
New York State Sea Grant Report Series No. NYSSGP-RS-78-13, (1978). 69 p, 14 fig, 5 tab, 7 ref, 12 map, 4 append.

Descriptors: *Mining, *Sands, *Gravels, *Environmental effects, Sediment transport, Sediment distribution, Dredging, *Resource availability, Environmental assessment, New York Bight, Offshore mining.

The area offshore considered appropriate to satisfy the Greater New York Metropolitan Area (G.N.Y.M.A.) demands for sand, gravel, and fi stretches from Atlantic City, New Jersey to th western border of Rhode Island. Data are presented and considered out to the 600-foot depth co tour although currently, the most favorable conditions for mechanical dredging are deposits ne shore in less than 30 feet of water. Data are pr sented at a level of detail sufficient for a region economic analysis. Even if only nominal growth the G.N.Y.M.A. by the year 2000 AD is consi ered, regional shortages of mineral aggregate w occur. Because of high transportation costs fo moving existing on-shore supply to demand site consumers and producers of sand and gravel w be forced to look offshore. Review of existi surveys indicates that large quantities of clean sa exist in the offshore reaches. A summary of of shore resources is given. Several problems w

emerge whenever mining occurs since the resource is located near shore. Conflicts will exist with local shellfishing interests. These conflicts may have either primary impact (direct disturbance of shellfish beds by dredging apparatus) or indirect impact (dumping of silt effluent which can cover and contaminate shellfish areas). (NOAA)
W79-03963

PCBS: THEIR ENVIRONMENTAL SIGNIFICANCE AND DISTRIBUTION IN RHODE ISLAND,
Rhode Island Univ., Narragansett. Coastal Resources Center.
For primary bibliographic entry see Field 5B.
W79-03964

WIND EROSION AND DEPOSITION ALONG A COASTAL SAND DUNE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2J.
W79-03965

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PRODUCTION AND CONSERVATION OF FRESH WATER,
Democritus Nuclear Research Center, Athens (Greece).
A. Delyannis, and E. Delyannis.
Chemical Engineering In a Changing World, p. 313-324. 14 ref. (1977).

Descriptors: *Desalination, *Desalination processes, *Water purification, Water treatment, Distillation, Electrodialysis, Reverse osmosis, Water conservation, Water management(Applied), Saline water intrusion, Water reuse, Irrigation water, Aquifers, Orange County, California, Colorado River, Yuma, Arizona, Groundwater recharge.

The progress made in desalination of brackish and sea water is reviewed. The desalination processes, distillation, electrodialysis, and reverse osmosis, are discussed with attention given to the impact of rising fuel prices on the cost of converted water. In some areas, Orange County, California, for example, water from a distillation plant is blended with reclaimed municipal sewage water, and injected into the ground to create a fresh water barrier which prevents sea water intrusion into the underground aquifer. Plans are underway for a desalination plant on the Colorado River at Yuma, Arizona, to treat irrigation drainage for use by Mexico. The plant, about 100 million gallons per day in size, may include both reverse osmosis and electrodialysis. (Davison-IPA)
W79-03568

NEW POLYMERIC MEMBRANES CONTAINING PHOSPHONATE ESTER GROUPS FOR WATER DESALINATION,
Gulf South Research Inst., New Orleans, LA.
I. C. Cabasso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 609, Price codes: A04 in paper copy, A01 in microfiche. Report January 1979. 62 p, 32 fig, 8 tab, 23 ref. OWRT No. 7545(1), 14-34-0001-7545.

Descriptors: *Membranes, *Reverse osmosis, Polymers, *Desalination processes, Membrane processes, Asymmetric membranes, Cellulose acetate, Poly(vinylpyridine), Polyphosphate, Alloy polymers.

Three novel polymer membranes for water desalination by reverse osmosis were originated and characterized. Two of these, alloy membranes, were composed of cellulose acetate/poly(bromophenylene oxide phosphonate) and cellulose acetate/poly(4-vinyl pyridine). The alloy membranes were cast as dense and asymmetric membranes. For the first alloy, CA/PPOBrP, two different structures have been identified for the asymmetric membrane: (1) the well known dense skin resting on an open-celled foam and (2) skin resting on a porous layer which displays a two-phase morphology. In the latter, dense spheres (0.1-1 micron) appear to grow out of a continuous polymer network. The second alloy, CA/PVPy, has the same morphology as cellulose acetate when cast as an asymmetric membrane. Both membranes have high water permeabilities and high salt rejections. The third membrane was an asymmetric PPOBrP membrane. This polymer was cast into an asymmetric membrane which displays a sharp boundary between the skin and the porous structure resembling a composite membrane. The presence of PPOBrP polymer in the alloys increases the membrane operation range, with respect to pH (up to pH 11) and free chlorine (approximately 100 ppm). The membranes cast from the homopolymer seem to have even better durability, but should be characterized further. The three novel membranes were tested under hydraulic pressures up to 1200 psi, producing fluxes of 5-40 gfd and salt rejections greater than 90 percent.
W79-03688

DESIGN, CONSTRUCTION, AND FIELD EVALUATION TESTS OF AN 10,000 GPD SKID-MOUNTED ALUMINA-LIME-SODA PILOT PLANT,
Midwest Research Inst., Kansas City, MO.
A. D. Tippit, E. P. Shea, and J. W. Nebgen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 755, Price codes: A05 in paper copy, A01 in microfiche. Technical Report (1978). 68 p, 7 fig, 22 tab, 3 append. OWRT (No 7546)(1), 14-34-0001-7546.

Descriptors: *Silica, Heavy metals, *Reverse osmosis, Brine, *Desalination processes, *Pilot plants, *Desalination plants, New Mexico, Dissolved solids, Operations, Silica removal, Water recovery, *Aluminum-lime-soda treatment.

A 10,000 gal/day skid-mounted alumina-lime-soda (ALS) pilot plant has been constructed and operated at the Office of Water Research and Technology Station at Roswell, New Mexico. The purpose of the pilot plant was to establish ALS operating parameters for removal of dissolved silica from reverse osmosis (RO) brines. Removal of silica foulant from RO brines permits further water recovery in additional RO stages. Results showed that dissolved silica could be routinely reduced to less than 12 mg/liter with the ALS process. Initial silica levels in the brine varied from 30 to 50 mg/liter. Optimum silica removal is accomplished in the pH range of 8.8 to 9.0. Common heavy metals were nearly quantitatively removed by the ALS process under optimum conditions for silica removal. Costs of the process range from $0.30/1,000 gal. to $0.35/1,000 gal. for waters initially containing 30 to 50 mg/liter of silica.
W79-03765

EXECUTIVE SUMMARY OF DESALTING PLANS AND PROGRESS, AN EVALUATION OF THE STATE-OF-THE-ART AND FUTURE RESEARCH AND DEVELOPMENT REQUIREMENTS,
Fluor Engineers and Constructors, Inc., Irvine, CA.
P. J. Schroeder, A. R. Khan, S. F. Mulford, A. S. Chan, and M. Gorry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 786, Price codes: A03 in paper copy, A01 in microfiche. September 1978. 47 p, 11 fig, 20 tab. OWRT T-0024(No 7707)(1).

Descriptors: *Desalination, *Desalting technology, Technology transfer, Economic analysis, *Cost analysis, *Water demand, *Water supply, Brackish water, *Future planning(Projected), Forecasting, *Reviews, *Research priorities, Research and development.

The study revealed that there is a future need for desalting technology. The largest market today is overseas, but the future market in the U.S. is much larger than the overseas market (about six times as large). The U.S. need for desalted water is expected to be over five billion gallons per day (BGD) by 1985 and over 29 BGD by the year 2000. A breakdown of these totals by the source of water demand is presented. Raw water supplies would be divided about as follows: 15.8 BGD from plain brackish waters (no contaminants or toxicants), 12.3 BGD from difficult brackish waters (industrial effluent wastewaters), and 1 BGD from seawater. The minimum expected desalted water demand for the overseas market is 5.45 BGD, by the year 2000. The major portion of this market is in the Middle East. A breakdown of this market is provided. Saudi Arabia has the largest demand of any nation just to supply their minimum needs for domestic and industrial use. The effects of adding agricultural use and finally steam-electric use are illustrated. A breakdown of the desalting market in other countries is provided. (See also W79-03776)
W79-03775

DESALTING PLANS AND PROGRESS, AN EVALUATION OF THE STATE-OF-THE-ART AND FUTURE RESEARCH AND DEVELOPMENT REQUIREMENTS,
Fluor Engineers and Constructors, Inc., Irvine, CA
P. J. Schroeder, A. R. Khan, and S. F. Mulford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 785, Price codes: A08 in paper copy, A01 in microfiche. Final Report, January 1978. 140 p, 24 fig, 28 tab, 25 ref. OWRT T-0024 (No 7707)(1).

Descriptors: *Reviews, *Desalination, *Technology transfer, Membranes, Distillation, Freezing, Economics, Evaluation, Cost projections, Market projection, Fixed costs, *Research priorities, *Future planning(Projected), Research and development.

An evaluation of the state-of-the-art of desalting technology (distillation, membranes, and freezing) was carried out. Potential desalting markets were estimated and present process economics were adjusted. Fully developed process economics were projected along with a development plan for each process. Cost and time requirements for each process development plan were estimated. A future market split among the three desalting processes is projected. A potentially large desalting market big enough to recover the future R and D investment in all three processes many times over is expected by the year 2000. The distillation process is still the best commercial and economical choice for seawater desalting and waste concentration. The freezing process can replace distillation at lower costs for desalting seawater and concentrating industrial effluents and waste waters if fully developed. However, this technology is presently undemonstrated commercially. Membrane processes have the greatest potential for cost reduction and are expected to dominate the desalting market for brackish and normal seawaters by the year 2000, and will have the largest market share. Seawater freeze desalting and seawater R.O. desalting water costs will be about a standoff when both processes are fully developed. (See also W79-03775)
W79-03776

APPARATUS FOR DESALINATING WATER,
R. E. Diggs
U.S. Patent No. 4,118,283, 19 p, 21 fig, 5 ref. Official Gazette of the United States Patent Office, Vol. 975, No. 1, p. 247, October 3, 1978.

Descriptors: *Patents, *Desalination, *Desalination processes, *Desalination apparatus, *Solar radiation, Separation techniques, Vapor compression distillation, Condensation.

A method and apparatus are disclosed in which water is heated utilizing solar energy and then transferred to a vacuum chamber where it is vaporized and the water vapor separated from the solid residue in a continuous flow process. The

water vapor is then transferred to a separate condensing chamber where it is condensed to form pure distilled water. Contaminated water flows across a grid and into a storage tank. The grid utilizes solar energy to heat that water to a predetermined temperature. A heat transfer structure which is dome-shaped and a preheater utilizing solar energy heats the water to a further predetermined temperature. An evaporator receives the heated water and exposes it to a vacuum condition so that the temperature of the water is above the saturation temperature. The water is thus vaporized, and solid contaminants are separated. The solids are deposited on a moving belt and are then moved into a solids removal system. Vapor transferring means removes the water vapor from the evaporator and transfers it to the heat transfer structure where it is condensed to form distillate which is free of solid contaminants. (Sinha-OEIS)
W79-03782

ELECTROCHEMICAL WATER DESALINATION PROCESS,
H. J. R. Maget
U.S. Patent No. 4,118,299, 11 p, 8 fig, 8 ref, Official Gazette of the United States Patent Office, Vol 975, No. 1, p. 252, October 3, 1978.

Descriptors: *Patents, *Desalination, *Desalination process, *Water purification, Sea water, Saline water, Electrochemistry, Electro-osmosis, Hydrogen, Electrodes, Desalination apparatus.

A process and apparatus are provided for purifying salt-containing water such as sea water, brackish water and mineralized water. The water stream is mixed with hydrogen and then pumped into an electrochemical cell where hydrogen is ionized into protons. These protons migrating to the counter-electrode, under the influence of an applied potential, entrain liquid water. At the counter-electrode, protons recombine to form hydrogen while releasing liquid water. Hydrogen is recycled and participates into the process only as a vehicle for the transport of water. This process is particularly applicable to the purification of water with high salt content. The process is carried out with two electrodes (an anode and a cathode as counter-electrode) separated by a cation exchange membrane. The cation exchange membrane is an important element in the process, since through its physical and chemical properties, it will prevent salt-containing water to flow directly to the counter-electrode (without undergoing the change from hydrogen gas to protons), will also prevent dissolved salts to migrate to the counter-electrode and will also provide a physical barrier between anode and cathode thus preventing mixing of impure and pure water streams.
W79-03783

3B. Water Yield Improvement

THE DEVELOPMENT AND PERPETUATION OF THE PERMANENT TAMARISK TYPE IN THE PHREATOPHYTE ZONE OF THE SOUTHWEST,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ
J. S. Horton
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 124-127, 19 ref.

Descriptors: *Riparian plants, *Phreatophytes, *Southwest U.S., *Shrubs, Riparian land, Vegetation, Trees, Cottonwoods, Willow trees, Wetlands, Streams, Seeds, Competition, Drought resistance, *Saltcedar.

Saltcedar (Tamarix chinesis) became naturalized and by the 1920's was a dominant shrub along the Southwestern rivers. Its aggressive characters allow it to be a permanent dominant in much of the phreatophyte vegetation in this region. Saltcedar produces seeds over a much longer period than do native species, it can become established after a summer recession flow when seeds of other species are not present. Mature saltcedar is more drought-resistant than competing native shrubs and trees. (Stihler-Mass)
W79-03718

AVIAN USE OF SALTCEDAR COMMUNITIES IN THE LOWER COLORADO RIVER VALLEY,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies
B. W. Anderson, A. Higgins, and R. D. Ohmart.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 128-136, 11 tab, 1 ref

Descriptors: *Riparian land, *Birds, *Census, *Colorado River, Wetlands, Riparian plants, Trees, Cottonwoods, Willow trees, Mesquite, Nongame birds, Wildlife, Streams, Density, Saltcedar.

Bird densities and bird speicies diversities (BSD) is saltcedar (Tamarix chinesis) stands of the lower Colorado River Valley were determined on a seasonal basis from May 1974 through February 1977. Comparisons were made between six saltcedar structural types as well as on a community level with seven other vegetation types. A method of determining the relative value of the communities, as well as the saltcedar structural types, based on density, density with 10 percent doves, BDS, BDS with 10 percent doves, number of species, structural diversity, and size of census area is described. Results showed the saltcedar community supported fewer birds than native communities, although tall, dense stands were valuable for nesting doves and rarer bird speicies in riparian communities along the lower Colorado River. (Stihler-Mass)
W79-03719

3C. Use Of Water Of Impaired Quality

ROOT GROWTH ALONG PLEXIGLAS SURFACES BY SUGARCANE UNDER DIFFERENT SOIL SALINITY CONDITIONS,
Texas Agricultural Experiment Station, Vernon.
C. J. Gerard.
Agronomy Journal, Vol. 70, No. 4, p 639-643, July-August, 1978. 7 fig, 1 tab, 12 ref

Descriptors: *Root development, *Salinity, Moisture stress, Growth stages, Sugarcane, Plant growth, *Saline soils, Crop response, Saline water.

Root growth of sugarcane (Saccharum officinarum L.) in soils irrigated with waters with electrical conductivities of 1.1, 5.0, and 8.0 mmhos/cm varied with stage of plant growth, time and salinity treatments. Root growth was greatest at soil depths of 20 to 60 cm in May, June, and July, a period of high growth rate and high evaporative conditions. During these months, average root intensities of sugarcane, irrigated with waters with salinities of 1.1, 5.0, and 8.0 mmhos/cm, were about 0.5, 1.0, and 1.5 mm/sq cm, respectively. Moisture stress induced by osmotic potentials of about -1.8 and -2.9 bar and high evaporative conditions stimulated root intensities but reduced top growth by 22 and 50%, respectively. These studies using root chambers have contributed to a better understanding of the interactive influences of stages of plant growth, salinity, and environment on root growth of sugarcane. (Skogerboe-Colorado State)
W79-03546

PLANNED WASTEWATER REUSE, A LITTLE-USED RESOURCE,
Municipal Environmental Research Lab., Cincinnati, OH
F. M. Middleton.
News of Environmental Research in Cincinnati, July 1977. 4 p, 1 fig, 1 tab, 7 ref

Descriptors: *Water reuse, *Water utilization, *Water conservation, Water shortage, Water supply, Public health, Economics, Cost analysis, Social impact, Federal Water Pollution Control Act, Safe Drinking Water Act, Municipal wastes, Recycling, Artificial recharge, Waste water treatment, Injection, Percolation.

Although water reuse has been practiced for a number of years in many areas, planned water reuse has become mandatory through the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) and the Safe Drinking Water Act of 1974. Activities related to water reuse by municipalities include long range plans for supplementing fresh supplies with renovated water, recharge to groundwater by injection or percolation of treated waste waters. In the water short areas of Dallas, Texas, and San Diego, California, it was found that providing 50% renovated water for these cities would cost 25% to 50% more than further development of natural supplies. This reuse will be necessary by early part of the next century, when more water supplies will be needed. A reuse potential check list is provided for communities to determine reuse feasibility by cost-effective analysis. Health effects of using renovated water and socio-economic considerations are discussed. It is concluded that Federal, state, and local authorities need to consider and begin programs incorporating reuse for the water resources of the nation. (Davison-IPA)
W79-03569

MANAGEMENT OF SALINE WATER,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B
W79-03774

3D. Conservation In Domestic and Municipal Use

URBAN RUNOFF CONTROL MASTER PLANNING,
American Society of Civil Engineers, Marblehead, MA. Urban Water Resources Research Program
For primary bibliographic entry see Field 6B
W79-03532

LEAST-COST DESIGN OF URBAN-DRAINAGE NETWORKS,
Washington Univ., Seattle. Dept. of Civil Engineering
For primary bibliographic entry see Field 5D
W79-03533

ENGINEERING SOLUTIONS TO BAY AREA DROUGHT CONDITIONS,
East Bay Municipal Utility District, Oakland, CA
For primary bibliographic entry see Field 4A
W79-03536

REGIONAL ECONOMETRIC FORECASTING MODELS: A TEST OF STRUCTURAL GENERALITY, DISAGGREGATION EFFECTS, AND POLICY ANALYSIS POTENTIALS,
Wisconsin Univ.-Madison. Dept. of Urban and Regional Planning
For primary bibliographic entry see Field 6A
W79-03593

URBAN WATER RESOURCES POLICY ALTERNATIVES: A SOCIOLOGICAL ANALYSIS OF DIFFERENTIAL PERSPECTIVES,
Purdue Univ., Lafayette, IN. Dept. of Sociology and Anthropology
For primary bibliographic entry see Field 6B
W79-03660

METHODOLOGIES OF EXAMINING POLLUTION FROM URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Civil and Environmental Engineering
For primary bibliographic entry see Field 5B
W79-03689

AN ECONOMIC ANALYSIS OF PRICING RESIDENTIAL WATER SUPPLIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 6B.
W79-03694

3E. Conservation In Industry

WET/DRY COOLING SYSTEMS FOR FOSSIL-FUELED POWER PLANTS: WATER CONSERVATION AND PLUME ABATEMENT,
United Engineers and Constructors, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5G.
W79-03547

POLLUTION ABATEMENT IN A COPPER WIRE MILL.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
For primary bibliographic entry see Field 5D.
W79-03572

ANALYSIS OF DIFFERENT TYPES OF DRY-WET COOLING TOWERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8C.
W79-03661

OPTIMUM COMBINATIONS OF COOLING ALTERNATIVES FOR STEAM-ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8C.
W79-03662

INDUSTRY VIEWS AND RESPONSIBILITIES IN OIL SPILL/WILDLIFE OPERATIONS,
American Petroleum Inst., Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03834

REUSE OF TREATED FRUIT PROCESSING. WASTEWATER IN A CANNERY,
Snokist Growers, Yakima, WA.
L. A. Esvelt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 805, Price codes: A07 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-78-203, September 1978. 124 p, 29 fig, 28 tab, 10 ref, 1 append. S803280.

Descriptors: *Water reuse, *Waste water treatment, *Industrial wastes, *Canneries, Reclaimed water, Biological treatment, Water purification, Biochemical oxygen demand, Chemical oxygen demand, Chlorination, Effluents, Filtration, Investigations, Feasibility studies, Economics.

The technical and economic feasibility of reusing treated cannery processing effluent for supplementing or replacing a portion of the raw water supply are examined. The study spanned two processing seasons during which reclamation of the biologically treated effluent by filtration through mixed media pressure filters and disinfection with chlorine was investigated. Trial uses of the reclaimed water included: (1) initial product conveying; (2) equipment, floor and gutter wash; (3) direct contact container cooling; (4) boiler feed. Steam from the reclaimed waste water was used for equipment cleaning, exhausting, cooking and blanching on a trial basis, and no degradation of the product resulted from this use. Results from this study, compared with a 1967-1968 evaluation, revealed that the biological treatment system performances were equivalent except that the present endogenous respiration rate of the biological sludge was lower. Lower emissions rates for flow, chemical oxygen demand and biochemical oxygen demand were shown during the earlier study due to more efficient in-plant controls. It is concluded that the biologically treated waste water can be reclaimed for reuse within the cannery except during periods of high suspended solids discharge from biological treatment. (Davison-IPA)
W79-03966

OVERVIEW OF THE FRESH PACK FOOD INDUSTRIES,
SRI International, Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W79-03970

OHIO RIVER BASIN ENERGY STUDY, ORBES PHASE I: INTERIM FINDINGS,
Illinois Univ., Urbana-Champaign.
For primary bibliographic entry see Field 6G.
W79-03971

3F. Conservation In Agriculture

QUANTITATIVE ESTIMATION OF LIVING WHEAT-ROOT LENGTHS IN SOIL CORES,
Agricultural Research Service, Pendleton, OR. Columbia Plateau Conservation Research Center.
K. J. Ward, B. Klepper, R. W. Rickman, and R. R. Allmaras.
Agronomy Journal, Vol. 70, No. 4, p 675-677, July-August, 1978. 4 tab, 5 ref.

Descriptors: *Root development, *Wheat, Dicots, Monocots, Sampling, *Soil cores.

A rapid, efficient method for separating living wheat (Triticum aestivum L.) roots from dead roots in field soil samples has been proposed. Combined techniques of separation, staining and length measurements were used to determine root density with an accuracy of plus or minus 9%. It was observed that most monocot roots stained more intensely than dicot roots, indicating that monocot-dicot root separation from the same root medium may facilitate studies of root competition. (Skogerboe-Colorado State)
W79-03514

INFLUENCE OF FERTILIZER AND RESIDUE MANAGEMENT ON GRASS SEED PRODUCTION,
Washington State Univ., Pullman. Dept. of Agronomy Soils.
C. L. Canode, and A. G. Law.
Agronomy Journal, Vol. 70, No. 4, p. 543-546, July-August, 1978. 3 tab, 8 ref.

Descriptors: *Grasses, Wheatgrass, Fescues, Bromegrass, *Fertilization, Burning, Air pollution.

The experiments were conducted on a silt loam soil (Pachi Ultic Haploxerolls) as a split-plot within each grass species. Main plots were three levels of 18-10-10-7 fertilizer applied to supply N at 90, 112, and 135 kg/ha, with an associated increase in P, K, and S. Main plots were split for open burning and two levels of mechanical residue removal. Two crops of red fescue and four seed crops of smooth bromegrass and crested wheatgrass were evaluated. Average seed yields (kg/ha) for burning compared with mechanical straw removal were 636 vs. 495 for red fescue, 1,122 vs. 848 for smooth bromegrass, and 872 vs. 790 for crested wheatgrass. Straw and stubble removal, compared with straw removal alone, increased seed yield of red fescue and smooth bromegrass, but decreased seed yield of crested wheatgrass. Interactions of fertilizer rates and residue management were not significant. The increase in seed production resulting from burning residue apparently was associated with control of downy bromegrass (Bromus tectorum L.) and increased vigor of autumn regrowth. (Skogerboe-Colorado State)
W79-03516

RELATIVE EVALUATION OF WATER STRESS INDICATORS FOR SOYBEANS,
International Crops Research Inst., Hyderabad (India). Semi-Arid Tropics.
M. V. K. Sivakumar, and R. H. Shaw.
Agronomy Journal, Vol. 70, No. 4, p. 619-623, July-August, 1978. 7 fig, 1 tab, 23 ref, 1 equ

Descriptors: *Soybeans, Soil-water-plant relationships, *Moisture stress, Moisture deficit, Growth rates, Plant growth, *Soil water, *Iowa, Indicators.

Field studies were conducted during 1976 on Ida silt loam (fine, silty, mixed (calcareous) mesic family of Typic Udorthents) at the Western Iowa Experimental Farm, Castana, Iowa, to evaluate three plant measurements (vis., stomatal conductance, leaf-water potential, and leaf area) as water stress indicators for soybeans (Glycine max (L.) Merr.). Daily means of stomatal conductance and leaf-water potential measured several times during the growing season were closely related to changes in soil-water potential. 'Rate of leaf-area expansion' which is defined as the change in average leaf area (leaf area/number of leaves) per plant over a period of time, also showed a close correspondence with soil-water potential. Relative growth rates of soybeans showed a negative correlation with stomatal conductance, leaf-water potential, and rate of leaf-area expansion. The three plant measurements should prove useful in explaining water-deficit effects quantitatively under field conditions. (Skogerboe-Colorado State)
W79-03521

ACCUMULATION AND REDISTRIBUTION PATTERN OF DRY MATTER AND N IN TRITICALE AND WHEAT VARIETIES UNDER WATER STRESS CONDITION,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
P. Lal, G. G. Reddy, and M. S. Modi.
Agronomy Journal, Vol. 70, No. 4, p. 623-626, July-August, 1978. 1 fig, 3 tab, 16 ref.

Descriptors: *Cereal crops, *Wheat, Moisture stress, Varieties, *Nitrogen, Translocation, Economic efficiency, Moisture deficit, Crop production, Grains(Crops).

The objective of this study was to screen varieties of triticale (Triticale hexaploide Lar.) relative to wheat (Triticum aestivum L.) for their high translocation ability and N utilization efficiency. A field experiment was conducted on silt loam soil (Typic Hapludoll) during 1973-74 at Pantnagar, India. Treatments consisting of five varieties each of triticale and wheat were arranged in a randomized block design with five replications. Plant samples were collected from a 0.125-sq m area for dry matter and N content studies in culm, lower leaf, flag leaf, spike chaff, and grain at successive stages. The loss of dry matter from different plant parts was assumed to be translocated to the grains. Both triticale and wheat cultivars differed greatly in their capacity to accumulate and redistribute dry matter and N. On an average, triticale cultivars removed larger amounts of N than the wheat. (Skogerboe-Colorado State)
W79-03530

INFLUENCE OF MANURE APPLICATION RATES AND CONTINUOUS CORN ON SOIL-N,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
F. R. Magdoff.

The manure-N experiments with continuous corn (Zea mays L.) were conducted on both a somewhat poorly drained Panton clay (Typic Ochraqualf) and a well-drained Calais loam (Typic Fragiorthod). Manure rates of 0, 22, 44, and 66 metric tons/ha/year were combined in factorial arrangement with ammonium nitrate rates of 0, 112, and 224 kg N/ha/year. Comparison of calculated theoretical soil-N with experimentally determined levels after 5 years and the response of corn to fertilizer-N indicate that mineralization of manure organic-N, when applied to the Panton clay, was less than when applied to the Calais loam. Thus,

manure-N was less available to the growing crop on the clay and accumulated in the soil at a greater rate than in the loam. The annual manure application rates required to maintain initial soil N levels in Panton clay and Calais loam under continuous corn production were calculated to be 40 to 52 tons/ha respectively. Two mineralization models were examined: Model 1 assumed only the first year manure mineralization rate above native soil organic matter decomposition rate; Model 2 assumed a 5-year mineralization decay series. Both were effective in predicting final soil-N levels. (Skogerboe-Colorado State)
W79-03540

MEASURING SYMBIOTIC NITROGEN FIXATION IN RANGELAND PLOTS OF TRIFOLIUM SUBTERRANEUM L. AND BROMUS MOLLIS L.,
California Univ., Davis. Dept. of Agronomy and Range Science; and California Univ., Davis. Dept. of Vegetable Crops
For primary bibliographic entry see Field 7B
W79-03552

EFFECTS OF SOIL WATER STRESS ON GROWTH AND NUTRIENT ACCUMULATION IN CORN,
Kasetsart Univ., Bangkok (Thailand). Dept. of Soil Science.
V. Verasan, and R. E. Phillips
Agronomy Journal, Vol. 70, No. 4, p. 613-618, July-August, 1978. 6 fig, 10 ref.

Descriptors: *Moisture stress, *Moisture deficit, *Corn(Field), Plant growth, Nutrients, Plant physiology, Transpiration, *Moisture tension

The objective of this study was to more clearly delineate the effect of soil water stress on growth and accumulaton of nutrient ions in corn. Corn was grown in the greenhouse in 20-liter pots containing soil from the Ap horizon of Maury silt loam (Typic Paleudalfs) under two soil moisture treatments, stressed and nonstressed. The relationship soil was potential and cumulative evapotranspiration with nutrient accumulation and dry matter production were more significant than the relationship of soil water potential with dry matter production and nutrient accumulation. Since water stress affects turbidity, photosynthesis, respiration, cell enlargement, and other physiological processes of the plant, it was concluded that cumulative transpiration is a better integrator of the effects of these processes on plant growth than is soil water potential. (Skogerboe-Colorado State)
W79-03553

EVALUATION OF PROTEIN AND NUTRITIVE FIBER CONTENT OF CULTIVATED RUSSIAN - THISTLE,
New Mexico Agricultural Experiment Station, University Park
D. A. Farmer, J. L. Fowler, and J. H. Hageman
Agronomy Journal, Vol. 68, p. 691-692, July-August 1976. 2 tab, 18 ref. OWRT A-049-NMEX(1).

Descriptors: *Forages, *Nutrient requirements, *Proteins, Fertilizer, Essential nutrients, Nitrogen compounds, Evaluation, Chemical analysis, *Russian-thistle, Amino acids, Natural use, Efficiencies

Nutritional parameters of Russian-thistle, Salsola sp., grown under controlled green house conditions, were measured. Various levels of nitrogen fertilizer were applied resulting in a protein content for the flowering plants of 19.8 - 3.6% for all levels of nitrogen application. Acid detergent ligin fiber values averaged 34.5 - 5.3%, ad acid detergent fiber values averaged 6.4 - 1.6%. No correlations were found between nitrogen application and total crude protein, acid detergent fiber, or acid detergent lignin. The amino acid composition of the total protein was nutritionally well balanced. These values are comparable to many commonly used forages. (Davison-IPA)
W79-03587

INTERREGIONAL IMPACTS OF ALTERNATIVE WATER POLICIES FOR IRRIGATION IN THE WESTERN UNITED STATES: A QUANTITATIVE ASSESSMENT,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics
For primary bibliographic entry see Field 6B.
W79-03664

OUTLOOK FOR ENERGY AND IMPLICATIONS FOR IRRIGATED AGRICULTURE,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology
W. P. Patton, and R. D. Lacewell.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 588. Price codes: A04 in paper copy, A01 in microfiche. Texas Water Resources Institute, Texas A and M University, Technical Report No. 87, September 1977, 60 p, 7 fig, 11 tab, 57 ref. OWRT A-037-TEX(2), 14-34-0001-7091, 7092, 8046

Descriptors: Energy, Water consumption, Water supply, Natural gas, Irrigated agriculture, Organic compounds, Pumping, *Energy costs, Groundwater, *Withdrawal, Texas Trans-Pecos, *Texas High Plains

Agriculture uses large quantities of energy to pump groundwater for irrigation. This means the cost of energy has important implications for the industry in terms of cost and profitability. Increases in the prices of energy sources such as natural gas, electricity, liquid petroleum gas and diesel can cause economic hardship for irrigators, particularly if those increases are unanticipated. The purpose of this paper is to briefly summarize important trends in the current domestic energy situation that could have significant impacts on the future cost and availability of energy, and to show what the implications of those trends are for irrigated agriculture. The primary focus is on trends in natural gas, since natural gas is the major fuel used for irrigation in the Great Plains states.
W79-03667

COMBATING PHEASANT LOSSES IN THE COLUMBIA BASIN - WHERE DO WE GO FROM HERE,
Washington State Univ., Pullman. Dept. of Agricultural Economics
For primary bibliographic entry see Field 6B.
W79-03686

PHEASANT ENHANCEMENT POTENTIALS IN IRRIGATED AGRICULTURE: A CASE STUDY OF THE COLUMBIA BASIN,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-03687

NOTE ON THE FERTILITY VALUE OF OXIDATION POND EFFLUENT FOR GROUNDNUT (ARACHIS HYPOGAEA L.),
Central Public Health Engineering Research Inst., Nagpur (India)
For primary bibliographic entry see Field 5D
W79-03696

ENVIRONMENTALIZING AGRICULTURAL PRODUCTION CONTROL POLICIES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics
For primary bibliographic entry see Field 5G
W79-03767

METHOD AND MEANS FOR IRRIGATING SOIL AND GROWING PLANTS HAVING VARYING WATER REQUIREMENTS,
W. Skaife
U.S. Patent No. 4,117,685, 4 p, 7 fig, 8 ref. Official Gazette of the United States Patent Office, Vol. 975, No. 1, p. 50, October 3, 1978.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, Soil-water-plant relationships, Irrigation practices, Irrigation efficiency, Water requirements, Moisture uptake.

A material having high water absorption and retention capacity is placed in a water impermeable trench beneath a top coversoil and water is supplied to the material for being transmitted by capillary action to the top soil. The material may be vitera. The roots of plants having varying water requirements will grow to whatever depth is appropriate for their needs. (Sinha-OEIS)
W79-03780

WATER COLLECTION INDICATOR DEVICE,
R. F. Cahill
U.S. Patent No. 4,119,056, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 975, no 2, p 515, October 10, 1979.

Descriptors: *Patents, *Measurement, *Irrigation, Irrigation practices, Irrigation efficiency, Water levels, Water requirements, Water supply, Equipment

Some of the advantages of this invention are that the amount of irrigation water to be supplied to crops can be preselected, the actual water supplied to the crops can be measured, a signal is produced which is visible over long distances and from any direction. Rainfall can also be measured so that total irrigation watering can be limited to a desired amount. A water collection indicator device includes a cup-like collector for collecting water, a signal member telescoping relative to the collector, a bias spring forcing the signal member away from the collector, and an actuator pivotally supported in the collecting including an arm engaging the signal member to prevent movement of the signal member away from the collector and a float movable with rising water level in the collector to pivot the actuator and disengage the arm from the signal member whereby the bias spring will move the signal member away from the collector to produce a visual signal indicating collection of a predetermined amount of water. (Sinha - OEIS)
W79-03785

MOBILE AGRICULTURAL IRRIGATION APPARATUS,
H. Tidwell
U.S. Patent No. 4,119,272, 4 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 975, no 2, p 589, October 10, 1978.

Descriptors: *Patents, *Irrigation, *Application equipment, Irrigation practices, Irrigation efficiency, Water conveyence, Self-propelled equipment, Irrigation boom.

A self-contained and self-propelled irrigation apparatus for row crops embodies a comparatively short closed end apertured irrigation boom which receives water through the tubular shaft of a hose reel mounted on the boom. The boom and hose reel are carried by a wheeled support which includes widely spaced traction wheels and a centrally stabilizing wheel. A platform on the boom mounts an engine and drive trains for the traction wheels and hose reel. (Sinha - OEIS)
W79-03786

FLUID SPRAY HEAD AND METHOD ADAPTED TO SPRAY SPECIFIC PATTERN,
Toro Co., San Marcos, CA. (Assignee)
E. J. Hunter
U.S. Patent No. 4,119,275, 8 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 975, No. 2, p. 590, October 10, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Sprays, Application equipment, Flow control

An improved fluid spray head for sprinkler apparatus is disclosed adjustable both as to the flow rate of fluid, the discharge surfaces and the precipitation rate over the ground area sprayed, and pa

ticularly adapted to spray a specifically shaped non-circular area. The spray head has circumferentially-spaced discharge orifices having cross-sectional areas equally proportional to the square of the distance that their respective spray streams are desired to travel whereby the perimeter of the ground area sprayed defines the preselected shape and receives a substantially uniform coverage of fluid. The spray head includes an inner tubular member which telescopes within an outer tubular member to provide the simultaneous adjustment of the size of the discharge orifices. The inner tubular member is made radially thinner so as to be more pressure expandable under fluid pressure to thereby tighten the fluid seal between the inner tubular member and the outer tubular member. Methods for constructing and operating a fluid spray head adapted to spraying a specific pattern or shaped area are also disclosed. (Sinha-OEIS)
W79-03787

CENTER PIVOT IRRIGATION APPARATUS,
L. D. Holtzen.
U.S. Patent No 4,120,454, 9 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 975, No 3, p 994, October 17, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Water control, Application equipment, Electrical equipment, Self-propelled equipment, Center pivot irrigation system.

An electrically controlled water powered reversible center pivot irrigation apparatus is disclosed. The apparatus includes water-carrying conduits flexibly connected to each other and supported at intervals by self-propelled supports. Each of the self-propelled supports includes a water powered sprinkler which turns a drive shaft for propulsion of the support. An electrically controlled transmission designates the direction in which the support travels and mechanical linkages, operable in either direction of movement of the apparatus, control the flow of water from the conduits to the sprinklers depending upon the relative position between adjacent conduits. (Sinha-OEIS)
W79-03794

THE EFFECT OF STABILIZED, HYDROPHOBIC AGGREGATE LAYER PROPERTIES ON SOIL WATER REGIME AND SEEDLING EMERGENCE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 2G.
W79-03803

MEASUREMENT OF FURROW INFILTRATON RATES MADE EASY,
Science and Education Administration, Prosser, WA. Federal Research.
For primary bibliographic entry see Field 7B.
W79-03807

RADIATION AND ENERGY BALANCE OF A TRICKLE-IRRIGATED LEMON GROVE,
Arizona Water Resources Research Center, Tucson.
J. Ben-Asher, and T. W. Sammis.
Agronomy Journal, Vol. 70, No. 4, p 568-572, July-August, 1978. 4 fig, 2 tab, 7 ref. OWRT B-035-ARIZ(8) and B-045-ARIZ(9).

Descriptors: Water conservation, Irrigation, *Irrigation systems, *Evapotranspiration, *Lemons, Albedo, *Radiation, *Energy budget, Trickle irrigation.

This study was conducted to evaluate the water saving potential and evapotranspiration from a trickle irrigated lemon grove (Citrus limon L. 'Lisbon'). Detailed measurements of global, reflected, and net radiation and its dissipation above the plant, the unshaded sandy soil, and the area as a whole were made in the spring and summer of 1975. Two sources of radiant energy were observed: net radiation which accounted for 70% of the energy utilized in evapotranspiration and reflected radiation from the unshaded soil accounting for 30%. Experimentally the net radiation and the evapotranspiration from the area as a whole decreased and vice versa. On the other hand, evapotranspiration and its ratio to evaporation from a class A pan were smaller than any previously reported values. Therefore, it is suggested that for these two periods the contribution of energy from the dry area to the wet did not reflect a specific disadvantage for trickle irrigation. (Skogerboe-Colorado State)
W79-03828

NATIONAL CONFERENCE ON MANAGEMENT OF NITROGEN IN IRRIGATED AGRICULTURE.
For primary bibliographic entry see Field 5G.
W79-03941

THE INDISPENSABLE ROLE OF NITROGEN IN AGRICULTURAL PRODUCTION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
R. A. Olson.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 1-31, 1978. 10 fig, 2 tab, 35 ref.

Descriptors: *Nitrogen, *Fertilizers, Nutrients, *Crop production, Crop response, Pollutants.

The indispensable role of nitrogen in food and fiber production for the world's people cannot be disputed. There is no substitute for nitrogen in its essential roles as a component of the chlorophyll and protein constitutents of crop plants. The quantity required for obtaining an economic yield of most crops exceeds that of all other soil-derived essential nutrients. The advent of relatively cheap fertilizer nitrogen in the 1950's caused radical increases in yields obtainable with most crops in the developed countries and provided the spark that ignited the Green Revolution in many of the Less Developed Countries in the 1960's as well. Its preeminence in the food production chain notwithstanding, nitrogen has been subjected recently to more critical surveillance than any other element in agriculture by reason of energy expended in its conversion into fertilizers, its monetary cost to the farmer, and its potential role as environmental pollutant. The economic and environmental problems can be minimized, however, by matching rate and timing of applied nitrogen with the amount likely to be provided the soil during the growing season and with the water regime afforded. The agricultural sector must achieve this matching objective promptly if it is not to be condemned by the rest of society in the long term. (See also W79-03941) (Skogerboe-Colorado State)
W79-03942

NITROGEN FORMS AND CYCLING IN RELATION TO WATER QUALITY,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 5G.
W79-03943

SOURCES OF NITROGEN FOR CROP UTILIZATION,
Potash/Phosphate Inst. Manhattan, KS.
For primary bibliographic entry see Field 5G.
W79-03944

REMOVAL OF NITROGEN BY VARIOUS IRRIGATED CROPS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
T. C. Tucker, and R. D. Hauck.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 135-167, 1978. 2 fig, 7 tab, 16 ref

Descriptors: *Nitrogen, *Nutrient removal, Crop production, Fertilizers, Soil management.

Harvested agronomic and horticultural plants, excluding rice, are grown under irrigation on over 16 million hectares of land in 33 states. The paper presents results of a survey of published and recent unpublished information on removal of soil and fertilizer nitrogen from irrigated land in the harvested portion of crops. The amount of nitrogen removed varied considerably among different plant species and within the same species when grown under widely different management and environmental conditions. The amount of fertilizer nitrogen apparently removed during harvest was greater for hay, silage, and pasture crops and least for certain vegetables, fruits, and nuts. The amounts of nitrogen removed by grain crops generally was within the average range for all crops, 40 to 60% of the nitrogen applied. Fertilizer efficiency is discussed from three main viewpoints in terms of (1) the amount of applied nitrogen found in the plant, (2) the yield of harvested plant parts in relation to amount of fertilizer nitrogen applied, and (3) the cash value of marketable crop in relation to nitrogen cost. Examples are given, using data for coastal bermudagrass and wheat, of fertilizer efficiency as calculated on the basis of these viewpoints. Methodological problems of collecting data and problems of data interpretation are discussed in relation to the several concepts of fertilizer efficiency, and emphasis is placed on the need to recognize the role of all soil, and crop management factors in determining the efficiency by which plants use nitrogen. (See also W79-03941) (Skogerboe-Colorado State)
W79-03946

VOLATILE LOSSES OF NITROGEN FROM SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. E. Rolston
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 169-193, 1978. 4 fig, 18 ref.

Descriptors: Denitrification, *Volatility, *Nitrogen, Fertilization, *Soils

Nitrogen may be lost from soil in the gaseous form by two major mechanisms, ammonia volatilization and denitrification. Ammonia gas may be lost to the atmosphere whenever ammonium compounds are applied to the soil surface. The greatest ammonia losses occur from calcareous soils at high soil pH. Fertilizers such as urea and ammonium sulfate result in greater ammonia loss than that from ammonium nitrate when applied to a moist soil surface. More than 50% of the applied fertilizer may be lost by ammonia volatilization if precautions are not taken. The best solution for minimizing ammonia loss is to incorporate or place ammonium compounds approximately 10 cm below relatively dry surface soil. The volatile products of denitrification, nitrous oxide and nitrogen gas, may be lost from the soil whenever the soil becomes wet enough that oxygen becomes depleted and sufficient carbon is available from organic materials to support microbial activity. Denitrification occurs significantly only over a very narrow soil-water content range near saturation and in those portions of the soil profile with fairly high organic material. Consequently, denitrification will generally only occur in the surface 60 cm of most soils of arid regions unless perched water tables exist at a buried surface horizon. Management practices to either minimize or maximize denitrification should be directed at controlling nitrate position and water content in the surface soil. (See also W79-03941) (Skogerboe-Colorado State)
W79-03947

LEACHING OF NITRATE FROM SOILS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils
For primary bibliographic entry see Field 5G.
W79-03948

EFFECT OF WATER MANAGEMENT ON NITRATE LEACHING,
California Univ., Riverside. Dept. of Soil and Ir-

vironmental Sciences
J. Letey, J. W. Biggar, L. H. Stolzy, and R. S. Ayers.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 231-249, 1978. 4 fig, 3 tab.

Descriptors: *Nitrates, *Leaching, Water pollution, *Water management(Applied), *Nitrogen, Fertilization, Effluents, Correlation analysis

Nitrates which are leached (transported below the root zone) represent a resource loss and a potential contribution to water pollution. The amounts of leached nitrates for a given time period were determined at various commercial farming sites in California and in a carefully controlled experimental plot receiving various water and fertilizer application treatments. Some of the agricultural sites had tile drainage systems and others had 'free drainage' to the groundwater. Linear regression analyses were conducted on the data. Similar results were observed for the tile and free drainage systems. The highest correlation coefficient was achieved for the amount of leached nitrates versus the product of the drainage volume and fertilizer nitrogen application. The next highest correlation coefficient was for amount leached versus drainage volume followed by amount leached versus fertilizer nitrogen application. In most cases there was no significant correlation between nitrate concentration in the water below the root zone and drainage volume or fertilizer nitrogen application. A significant linear relationship between amount of leached nitrate and drainage volume was also obtained at the experimental plot. (See also W79-03941) (Skogerboe-Colorado State)
W79-03949

MONITORING WATER FOR NITROGEN LOSSES FROM CROPLANDS,
California Univ., Davis. Dept. of Land, Air and Water Resources
For primary bibliographic entry see Field 5G
W79-03950

USE OF MATHEMATICAL RELATIONSHIPS TO DESCRIBE THE BEHAVIOR OF NITROGEN IN THE CROP ROOT ZONE,
Florida Univ., Gainesville. Dept. of Soil Science
J. M. Davidson, and P. S. C. Rao
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 291-319, 1978. 7 fig, 3 tab, 27 ref

Descriptors: *Nitrogen, Denitrification, *Root zone, Soil water movement, *Mathematical studies

A procedure to estimate the movement of water-soluble nitrogen species (NO_3 and NH_4) was developed by assuming that (1) the soil-water residing in all pore-sequences participates in the transport process, and the (2) the soil-water initially present in the soil profile was completely displaced ahead of the water entering at the soil surface. Field-capacity and initial soil-water content distribution in addition to total water inputs were necessary parameters to estimate solute transport in the root zone. First-order kinetics were assumed to describe the nitrogen transformations (mineralization, immobilization, nitrification, and denitrification). These transformation processes were considered to occur under ideal conditions. Plant uptake of water and nitrogen (nitrate and ammonium) was estimated, respectively, from potential evapotranspiration and nitrogen uptake rate under ideal environmental conditions for a given crop. Actual plant uptake of water and nitrogen was dependent upon the available soil water and total mineral nitrogen within the crop root zone. These mathematical relationships could be solved using a programmable desk-top calculator; however, a larger computer was needed when more complex submodels were employed to describe soil-water uptake. The proposed mathematical relationships can provide field managers and regulatory personnel with an integrated description of the behavior of nitrogen in the root zone during a crop growing season. (See also W79-03941) (Skogerboe-Colorado State)
W79-03952

DIAGNOSTIC TECHNIQUES USED TO IDENTIFY OPTIMUM LEVELS OF NITROGEN FERTILIZATION FOR IRRIGATED CROPS,
Oregon State Univ., Corvallis. Dept. of Soil Science
T. L. Jackson.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 321-332, 1978. 27 ref.

Descriptors: *Nitrogen, *Fertilization, Irrigation water, Nitrates, Analytical techniques.

The nitrogen available for plant growth comes primarily from (1) the nitrogen released from soil humus and crop residues, (2) nitrogen added as commercial fertilizers and (3) residual inorganic nitrogen from previous growing seasons or previous crops. Irrigation insures adequate moisture and relatively uniform yields from year to year. Irrigation also makes feasible the application of fertilizer nitrogen during the growth of the crop and this provides the opportunity to use soil and plant analysis early in the crop season to assess nitrogen needs. Examples of the use of diagnostic techniques for estimating the fertilizer nitrogen required to supplement residual nitrogen levels and the capacity of the soil to release nitrogen are presented. (See also W79-03941) (Skogerboe-Colorado State)
W79-03953

ECONOMIC CONCEPTS AND POLICIES RELATED TO CONTROLLING NON-POINT SOURCE POLLUTION STEMMING FROM AGRICULTURE,
Washington State Univ., Pullman. Dept. of Agricultural Economics
For primary bibliographic entry see Field 5G
W79-03954

ECONOMIC IMPACTS OF CONTROLLING NITROGEN CONCENTRATION AND OTHER WATER QUALITY DETERMINANTS IN THE YAKIMA RIVER BASIN,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics
For primary bibliographic entry see Field 5G
W79-03956

NITROGEN BALANCES FOR THE SANTA MARIA VALLEY,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5G
W79-03957

AN ECONOMIC METHODOLOGY FOR EVALUATING 'BEST MANAGEMENT PRACTICES' IN THE SAN JOAQUIN VALLEY OF CALIFORNIA,
Economics, Statistics, and Cooperatives Service, Washington, DC
For primary bibliographic entry see Field 5G
W79-03958

OVERVIEW OF NITROGEN IN IRRIGATED AGRICULTURE,
California Univ., Davis. Cooperative Extension
For primary bibliographic entry see Field 5G
W79-03959

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

'INSTREAM FOW'-APPLICABILITY OF EXISTING METHODOLOGIES FOR ALASKAN WATERS,
Woodward-Clyde Consultants, Anchorage, AL.
A. G. Ott, and K. E. Tarbox
Final Report, Alaska Department of Fish and Game and Department of Natural Resources, August 1977. 70 p, 9 fig, 5 tab, 22 ref, 1 append

Descriptors: *Alaska, *Streamflow, *Rivers, *Methodology, *Hydrology, *Water demand, Legislation, Statutes, Regulation, Classification, Reviews, Discharge(Water), Fish, Biological communities, Seasonal, Aerial photography, Meandering streams, Braided streams, Straight streams.

To facilitate planning for an expected increase in water requirements in Alaska due to oil and gas development, transfer of public lands to private ownership, and hydroelectric projects, applicability of 11 methodologies for instream flow requirements for maintaining fish and wildlife was evaluated. It is concluded that, due to extreme seasonal flow variability of the streams, diversity of stream types, absense of a hydrological data base, and lack of sophisticated field studies, no single method reviewed is applicable. Recommendations: (1) In the absence of detailed field investigations, the Montana Method may be applied to mountainous, split, and single-channel meandering streams, provided that limited field testing in Alaska verifies the basic relationships of the method. (2) For streams with immediate water allocation problems, field investigations using methods of the U.S. Fish and Wildlife Service Instream Flow Group should be initiated, and these methods should be refined for ultimate use on other Alaskan stream systems. (3) For braided, split-channel, and incised streams, field investigations should be started to define hydrological and biological relationships relative to altered flow patterns. Other methods reviewed: U.S. Fish and Wildlife (Billings, Montana; Oregon; Washington; U.S. Forest Service; Idaho Fish and Game; Indicator Species; Trout Cover Rating System; Habitat Quality Rating; and Waters. (Lynch-Wisconsin)
W79-03517

OPTIMAL SEQUENCING FOR A MULTIPURPOSE WATER SUPPLY SYSTEM,
Banyaszati Kutato Intezet, Budapest (Hungary).
I. Bogardi, F. Szidarovszky, and L. Duckstein
Advances in Water Resources, Vol. 1, No. 5, p 275-284, 1978. 10 fig, 4 tab, 20 ref.

Descriptors: *Water resources development, *Water supply, *Multiple-purpose, *Optimization, *Economic efficiency, *Sequencing, *Cost minimization, Dynamic programming, Water requirements, Water shortage, Water allocation(Policy), Equations, Mathematical models, Systems analysis, Economic losses, Game-theoretical method, Non-linear programming, Planning.

The optimal sequencing of a multipurpose water supply system in the Hajduhatsag region of Hungary is determined using dynamic programming (DP). The goal function minimizes the present value of capital costs, operating costs, and economic losses due to water shortages. Future water requirements are considered to be random variables because of natural and forecasting uncertainties. The nonlinear optimization problem at each stage is equivalent to a readily solved game theoretical problem, the solution of which is straightforward. Sensitivity analysis performed with respect to economic losses, water requirements, and discount rate has shown that optimal development and sequencing depend largely on the economic losses and the discount rate. (Bell-Cornell)
W79-03518

WATER RESOURCES CONTROL THROUGH SYSTEMS ANALYSIS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
D. R. Maidment.
Water Supply and Management, Vol. 2, No. 3, p. 243-251, 1978. 34 ref.

Descriptors: *Water resources, *Control, *Systems analysis, *Short-term operation, *Long-term operation, Water allocation(Policy), Floods, Simulation analysis, Data collections, Optimization, Reservoir operation, River basins, Operating policy.

Systems analysis can be applied to short-term and long-term operation and control of water resources systems. Short-term operation over hours or days is concerned with transient phenomena such as floods, and requires operating policies which are being continuously updated as new measured information is received. Long-term operation over months or years is concerned with allocation of water among competing users, taking account of possible shortages of water supply due to droughts. Systems analysis application procedures which develop appropriate operating policies are described together with some experiences gained in the implementation of these procedures in various countries. Topics requiring further applied systems analysis are identified. (Bell-Cornell)
W79-03519

ALLOCATIONAL INEFFICIENCY OF BENEFIT/COST APPLIED TO WATER AND SEWERAGE SUPPLY: INTERACTIONS BETWEEN TIME-SERIES AND CROSS-SECTIONAL MODELS,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-03520

SIMULATION PROCEDURES FOR BOX-JENKINS MODELS,
University of Western Ontario, London.
For primary bibliographic entry see Field 2E.
W79-03523

RECENT DEVELOPMENTS IN THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM AREA,
Army Engineer Div., Southwestern Dallas, TX.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-054 146, Price codes: A07 in paper copy, A01 in microfiche. IWR Research Report 77-R1, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, April 1977. 130 p, 12 fig, 25 tab, 1 plate, 47 ref.

Descriptors: *River systems, *Navigation, *Data collections, *Demographic factors, *Economic development, *Public sectors, *Projects, Agriculture, Recreation, Industries, Transportation, Harbors, Population, Employment, Natural resources, Public policy.

This report brings together data and a description of demographic, economic development, and public sectors which identify current conditions in the area of the McClellan-Kerr Arkansas River Navigation System for the years 1971-1974. Discussed are natural resources, transportation and port development, industrial development, agricultural development, recreation developments, public policy response, opportunities and problems, and population, employment and income. The project includes the navigation channel extending from the Mississippi River to Catoosa, Oklahoma and the three major upstream lakes which were originally authorized in the navigation plan, costing over $1.2 billion. The primary impact area described herein includes 28 counties bordering the waterway and the three upstream lakes. (Bell-Cornell)
W79-03526

CLIMATE, CLIMATIC CHANGE, AND WATER SUPPLY,
National Research Council, Washington, DC.
For primary bibliographic entry see Field 2B.
W79-03527

WATER-RESOURCE SYSTEMS PLANNING,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 6B.
W79-03528

URBAN RUNOFF CONTROL MASTER PLANNING,
American Society of Civil Engineers, Marblehead, MA. Urban Water Resources Research Program.
For primary bibliographic entry see Field 6B.
W79-03532

LAND USE ALLOCATION MODEL FOR FLOOD CONTROL,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
L. D. Hopkins, E. D. Brill, Jr., J. C. Liebman, and H. G. Wenzel, Jr.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 104, No WR1, p 93-104, November 1978. 2 fig, 14 equ, 25 ref.

Descriptors: *Flood control, *Land use, *Nonstructural alternatives, *Optimization, Water resources, Runoff, Dynamic programming, Hydrology, Flood damage, Upstream, Downstream, Computer models, Watersheds(Basins), Urban development, Urban planning, Triangle routing procedure, Economic rent maximization, Equations, Systems analysis.

A dynamic programming model is developed that finds the optimal allocation of land uses to maximize economic rent to land net of flood damage. The model specifically considers the impact of upstream development on downstream flood levels and the impact of flood-plain development on the amount of damage for given flood levels. An efficient, but elementary, routing procedure is developed to meet the requirements of the dynamic programming model. The model is demonstrated on realistic data for a watershed with 42 subbasins and eight land-use categories. This test problem is solved in several trials, each requiring about 30 seconds of computing time. The solutions appear to be stable despite the artificial discretization of flood flows. The model is useful for exploring the relationships among land use decisions and flood damages and for identifying target land use patterns for particular watersheds. (Bell-Cornell)
W79-03534

ENGINEERING SOLUTIONS TO BAY AREA DROUGHT CONDITIONS,
East Bay Municipal Utility District, Oakland, CA.
D. G. Larkin.
Journal of the Water Resources Planning and Management Division, Proceedings of the America Society of Civil Engineers, Vol 104, No WR1, p 235-251, November 1978. 7 fig.

Descriptors: *Droughts, *Water deprivation, *Water conservation, Water quality, Standards, Pipe joints, Emergencies, Interconnected systems, Water supply, California, *San Francisco Bay Area, Water agencies, Water plans, Agreements.

California underwent a 2 year drought from 1976 to 1978 which had a serious effect on all water supplies in the State. In the San Francisco Bay Area, several local water agencies, in conjunction with Federal and State agencies, developed complex multi-party agreements of mutual aid to alleviate the drought emergency. In record time of only a month from conceptual plan to startup, drought-relief water was provided to the local agencies in need. Three formal agreements among the several parties were developed with minimum red tape because the engineering staffs of the agencies involved realized the urgency of the situation. This attitude prevailed in the planning and design, as well as in the construction contract. The facilities constructed provided both supplemental water and high quality dilution water, and the effects of the drought were minimized. (Bell-Cornell)
W79-03536

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana Champaign. Dept. of Civil Engineering.
R. W. Fuessle, R. M. Lyon, E. D. Brill, Jr., G. E Stout, and K. E. Wojnarowski.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 104, No WR1, p 193-209, November 1978. 3 fig, 8 tab, 35 ref.

Descriptors: *Cooling towers, *Planning, *Ohio River, *Water supply, *Thermoelectric power generation, *Water consumption, Water utilization, Irrigation, Municipal water, Industrial water, Plant siting, River basins, *Water allocation(Policy)

Widespread adoption of evaporative cooling towers will significantly increase water consumption by powerplants over the coming decades. The analysis presented includes consideration of allocation issues associated with other growing competitive uses: (1) municipal; (2) industrial; (3) irrigation; and (4) in-stream uses. Given hypothetical plant siting strategies suggested by the initial work of the Ohio River Basin Energy Study, consumption will represent high percentages of flows in the tributary basins of the lower Ohio River Basin, especially during 7-day, 10-year low-flow conditions. Consumption levels are shown for tributary river basins in Illinois, Indiana, Ohio, and Kentucky. Alternatives to high levels of consumption are suggested. In addition to presenting an analysis of water allocation in the Ohio Basin, this paper suggests a useful framework for analyzing water allocation in other regions. (Bell-Cornell)
W79-03537

DELAWARE RIVER BASIN WATER RESOURCES MANAGEMENT,
Delaware River Basin Commission, Trenton, NJ.
For primary bibliographic entry see Field 6B.
W79-03538

INFORMATION REQUIREMENTS FOR IMPROVING HYDROPOWER,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 8C.
W79-03542

ON THE THEORY AND MODELING OF DYNAMIC PROGRAMMING WITH APPLICATIONS IN RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources
M. Sniedovich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 586, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Dissertation, December, 1976. 112 p, 1 tab, 30 ref, 2 append (University of Arizona Reports on Natural Resource Systems No 27) OWRT B-043-ARIZ(23), 14-31-0001-5056.

Descriptors: *Dynamic programming, *Algorithms, *Model studies, *Reservoir operations, *Optimization, *Decision making, *Reservoir stages, Time series analysis, Computer models, Computer programs.

The validity of the principle of optimality and the dynamic programming algorithm in the context of discrete time and state multistage decision processes is discussed. The multistage decision model developed for the purpose of the investigation is of a general structure, especially as far as the reward function is concerned. The validity of the dynamic programming algorithm as a solution method is investigated and results are obtained for a rather wide class of decision processes. The intimate relationship between the principle and the algorithm is

investigated and certain important conclusions are derived. In addition to the theoretical considerations involved in the implementation of the dynamic programming algorithm, some modeling and computational aspects are also investigated. It is demonstrated that the multistate decision model and the dynamic programming algorithm as defined in this study provide a solid framework for handling a wide class of multistage decision processes. The flexibility of the dynamic programming algorithm as a solution procedure for nonroutine reservoir control problems is demonstrated by two examples, one of which is a reliability problem. Many of the theoretical derivations presented especially those concerning the relation between the principle of optimality and the dynamic programming algorithm, are novel.
W79-03671

LAND USE/COVER IN THE DEVILS LAKE BASIN, MAY-JUNE, 1975.
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4D.
W79-03672

MANAGEMENT OF SALINE WATER.
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-03774

MAP UNIT COMPOSITION ASSESSMENT USING DRAINAGE CLASSES DEFINED BY LANDSAT DATA.
Soil Conservation Service, Lafayette, IN.
For primary bibliographic entry see Field 7B.
W79-03802

GRAVIMETRIC VS. VOLUMETRIC DETERMINATION OF WATER STORAGE IN VERTICALLY UNSTABLE TILLAGE LAYERS.
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 7B.
W79-03806

NWS'S FLASH FLOOD WARNING AND DISASTER PREPAREDNESS PROGRAMS.
National Weather Service, Silver Spring, MD. Disaster Preparedness Staff.
For primary bibliographic entry see Field 6F.
W79-03816

4B. Groundwater Management

HEAT STORAGE WELLS: KEY TO LARGE-SCALE COGENERATION.
General Electric Co., Santa Barbara, CA. Center for Advanced Studies.
C. F. Meyer.
Public Power, p. 28-30, July-August 1977. 1 fig. OWRT C-5205(No. 4210)(7), C-6265(No. 5223)(16).

Descriptors: *Injection wells, *Aquifers, *Power system operation, *Heating, Heat exchangers, Aquifer systems, Water storage, Thermal capacity, Heated water, Heat transfer, Electric power production, Powerplants, Thermal powerplants, Utilities, Industries, Cities.

The concept of heat storage wells as adjuncts to total energy (cogeneration) systems is discussed. Groundwater pumped from a well drilled into a confined saline aquifer passes through a heat exchanger and is injected into another nearby well, the 'hot well', in the same aquifer. When heat is to be used, the water is pumped from the hot well through the heat exchanger, where the heat is removed, and then the water is injected into the warm well which has a higher temperature than the native groundwater. The hydrostatic pressure within the aquifer can maintain water as liquid at temperatures of 350F. The aquifer material is warmed by the flow of injected water through the aquifer pores; heat-recovery efficiency increases during successive cycles. The capital cost of wells, the heat exchanger, pumps and auxiliaries is estimated at $350,000 to $750,000 for a 20 mw (thermal) module. Costs of building this system on land, rather than drilling wells, are prohibitive. Experience with the 500 to 600 cogeneration systems in the U.S. shows a 25 to 35% energy savings can be achieved. The existing systems utilize small-scale heat storage. Studies indicate that large-scale cogeneration will come about only through securing a utility charter or involving an existing utility. District heating in Europe, and potential implementation of cogeneration systems by municipalities are discussed. (Davison-IPA)
W79-03586

NOTES ON A SERIES REPRESENTATION OF THE LEAKY AQUIFER WELL FUNCTION.
Nevada Univ. System, Las Vegas. Water Resources Center.
For primary bibliographic entry see Field 2F.
W79-03588

RECHARGE AND GROUNDWATER CONDITIONS IN THE WESTERN REGION OF THE ROSWELL BASIN.
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W79-03663

OUTLOOK FOR ENERGY AND IMPLICATIONS FOR IRRIGATED AGRICULTURE.
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 3F.
W79-03667

THE EFFECTS OF SPARY IRRIGATION ON A MIXED FOREST ECOSYSTEM.
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-03679

MEASUREMENT OF THE ENGINEERING PROPERTIES OF MUNICIPAL INCINERATOR RESIDUES AND CONSIDERATION OF LEACHATE CHARACTERISTICS.
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W79-03685

ESTIMATING GROUNDWATER RECHARGE FROM CONSERVATION BENCH TERRACES.
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W79-03692

HANDBOOK FOR HYDROGEOLOGISTS. VOLUME I. (SPRAVOCHNOE RUKOVODSTVO GIDROGEOLOGA).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 789. Price codes: E00 in paper copy, A01 in microfiche. Report TT 70-57765, Indian National Scientific Documentation Centre, New Delhi (India), 1975. 1033 p, 275 fig, 88 tab, 42 ref. Maximov, V. B., Editor.

Descriptors: *Canada, *Publications, *Hydrogeology, *Groundwater, Foreign countries, Foreign research, Methodology, Application methods, Technology, Engineering, Engineering education, Education, Schools(Education), Training, Investigations, Agriculture, Aquifers, Springs, Aquifer characteristics, Hydrologic cycle, *USSR.

The handbook was published in two volumes. The first volume provided information about general and special hydrogeology, principles of dynamics of groundwaters, and the problems of [illegible] groundwater in agriculture. The second edition dealt with the methods of investigations to be used in hydrogeology and described the means and modes for conducting the hydrogeological studies. The handbook was meant for engineers, technician-hydrogeologists, and other specialists engaged in hydrogeological studies and also for students and teachers of higher educational institutions and technical schools of corresponding specialities. (Froelich-ISWS)
W79-03798

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LYNN AND GRAZA COUNTIES, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS.
Texas Dept. of Water Resources, Austin.
A. E. Bell and S. Morrison.
Report 223, September 1978. 68 p, 18 tab, 71 ref, 24 map.

Descriptors: *Groundwater resources, *Texas, *Aquifers, *Data collections, Groundwater, Maps, Water resources, Aquifer characteristics, Groundwater recharge, Water supply, Groundwater availability, Groundwater mining, Overdraft, Pumping, Projections, Saturated flow, Water wells, Lynn County(Texas), Garza County(Texas), *Ogallala aquifer(Texas), Pumpage rates, Pumping lifts, Well yields.

This is one of numerous planed county studies covering the declining groundwater resource of the Ogallala aquifer in the High Plains of Texas. The report contained maps, charts and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Lynn and Garza Counties and the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the counties. However, the report does not attempt to project that portion of the volume of the water in underground storage which may be ultimately recoverable. The Ogallala aquifer in Lynn and Garza Counties contained approximately 2.4 million acre-feet of water in 1974. Historical pumpage has exceeded 120,000 acre-feet annually, which is more than twice the rate of natural recharge to the aquifer in the counties. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural production. (Humphreys-ISWS)
W79-03815

CONTRIBUTIONS TO THE HYDROGEOLOGY OF ALBERTA.
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2F.
W79-03819

THE HYDROGEOLOGICAL RECONNAISSANCE MAPS OF ALBERTA.
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 7C.
W79-03820

APPARENT TRANSMISSIVITY AND ITS DETERMINATION BY NOMOGRAM.
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2F.
W79-03821

SAMPLING OF GROUNDWATERS FOR CHEMICAL ANALYSIS.
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2K.
W79-03822

CHARACTERISTICS OF PUMPING TESTS CONDUCTED IN HETEROGENEOUS CLASTIC SEDIMENTS OF THE EDMONTON AREA, ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
R. Bibby.
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 31-39, 1977. 8 fig, 1 tab, 3 ref.

Descriptors: *Pumping, *Drawdown, *Groundwater, *Transmissivity, Curves, Aquifers, Wells, Water wells, Discharge(Water), Sedimentary structures, Sedimentary rocks, Geology, Data processing, Classification, Hydrology, Hydrogeology, *Alberta(Canada), Drawdown curves.

Drawdown curves of pumping tests conducted on 122 wells in the heterogeneous, clastic sediments of the Edmonton area were classified on the basis of their shapes when plotted on a semilogarithmic scale. Four basic shapes were recognized. These shapes, in general, do not conform to any theoretically predicted drawdown curves, and no completely acceptable explanation is known to account for their shape. The last straightline slope of the drawdown curves (and therefore the short-term transmissive capacity as calculated by Jacob's equation) was shown to have a long-normal probability distribution. This is of considerable significance when drawdown curves are used for predictive purposes. (See also W79-03819)(Sims-ISWS)
W79-03823

INVESTIGATION OF THE FEASIBILITY OF DEWATERING BURIED VALLEY SANDS TO AID SEWER-TUNNEL EXCAVATIONS, EDMONTON, ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8D.
W79-03824

DLSPLOT: A COMPUTER PROGRAM FOR TRANSLATING DOMINION LAND SURVEY COORDINATES TO UNIVERSAL TRANSVERSE MERCATOR COMPATIBLE COORDINATES,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 7C.
W79-03826

PUBLIC GROUNDWATER SUPPLIES IN HENDERSON COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 780, Price codes: A02 in paper copy, A01 in microfiche. Bulletin 60-23, 1978. 20 p, 2 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Bedrock, Sandstones, Dolomite, Groundwater availability, Groundwater, Water sources, Water quality, Water wells, Data collections, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers, Drillers logs, Henderson County(IL), Dissolved minerals, Water bearing formations.

All available information on production wells used for public groundwater supplies in Henderson County, Illinois, was presented. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. The report included separate descriptions for groundwater supplies of 6 municipalities and 1 state park. These were preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for public use. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer or aquifers tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analysis. (Humphreys-ISWS)
W79-03827

A CASE STUDY-NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5B.
W79-03955

4C. Effects On Water Of Man's Non-Water Activities

THE EFFECTS OF MOTORWAY CONSTRUCTION ON AN URBAN STREAM,
Polytechnic of Central London (England).
For primary bibliographic entry see Field 5C.
W79-03639

MOTORBOAT USE ON THE WILD ROGUE RIVER: AN INVESTIGATION OF USE BETWEEN WATSON CREEK AND BLOSSOM BAR,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W79-03695

WILDLIFE CONFLICTS IN RIPARIAN MANAGEMENT: GRAZING,
Coronado National Forest, Tuscon, AZ.
C. R. Ames.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p.49-51. 6 fig.

Descriptors: *Riparian land, *Riparian plants, *Grazing, *Cattle, Effects, Wetlands, Southwest U.S., Arizona, Livestock, Eutrophication.

Because of its high moisture content, riparian forage is highly palatable to cattle; and, availability of water and shade in riparian areas provide a strong influence for livestock to frequent such areas. Protection of riparian habitat from the negative effects of grazing can only be effectively achieved through fencing. (Stihler-Mass)
W79-03710

WILDLIFE CONFLICTS IN RIPARIAN MANAGEMENT: WATER,
Forest Service, Albuquerque, NM
For primary bibliographic entry see Field 6G.
W79-03711

MANAGEMENT ALTERNATIVES FOR RIPARIAN HABITAT IN THE SOUTHWEST,
Apache-Sitgreaves National Forest, Springerville, AZ.
For primary bibliographic entry see Field 6G.
W79-03712

SOME EFFECTS OF A CAMPGROUND ON BREEDING BIRDS IN ARIZONA,
Museum of Northern Arizona, Inc., Flagstaff.
S. W. Aitchison.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 175-182. 1 fig, 5 tab, 31 ref

Descriptors: *Recreation, *Camp sites, *Birds, *Effects, *Arizona, Vegetation, Riparian land, Trees, Wildlife, Habitats, Camping, Wetlands, Streams.

Over a three-year period, breeding bird densities were found to be similar between a constructed campground and a relatively natural area when the campground was closed to campers. However, bird species composition differed between sites, the campground having relatively heavier bodied birds (x = 48.5 g) than the control area (x = 38.2 g). Once the campground was opened for human use, the breeding bird population decreased in density and diversity. On the control site the population either remained the same or increased. Locations for new campgrounds should be carefully scrutinized in terms of usage by wildlife; riparian habitats are important to birds and further destruction of this habitat in the Southwest neds to be discouraged. (Stihler-Mass)
W79-03724

IMPORTANCE, PRESERVATION, AND MANAGEMENT OF RIPARIAN HABITAT: AN OVERVIEW,
Museum of Northern Arizona, Inc., Flagstaff. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W79-03729

THE EFFECTS OF DITCHING A SALT MARSH ON COLONY AND NEST SITE SELECTION BY HERRING GULLS (LARUS ARGENTATUS),
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W79-03752

4D. Watershed Protection

SCOUR AND FILL PATTERNS IN POOL-RAPID RIVERS,
Arizona Univ. Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W79-03668

LAND USE/COVER IN THE DEVILS LAKE BASIN, MAY-JUNE, 1975.
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 615. Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Inst., North Dakota State University, Research Project Technical Paper, WI-321-001-77, June 15, 1977. 13 p, 2 fig, 11 tab. OWRT A-043-NDAK(2), 14-31-0001-5034.

Descriptors: *Land use, *Land management, Water management(Applied), Water utilization, *Watershed management, Watersheds(Basins), Flood control, *Classification, *North Dakota, North Central Region(ND), *Devils Lake Basin(ND).

Land use/cover data are presented as classified by EPIC (Warrenton, Virginia) for May and June, 1975, for the Devils Lake Basin and for each watershed: Hurricane Lake Watershed, Stump Lake Watershed, Edmore Watershed, Starkweather Watershed, Chain Lakes Watershed, Mauvais Coulee Watershed, Devils Lake Watershed, South Slope Watershed. This information is important when considering water on land management alternatives for the Devils Lake Basin.
W79-03672

ADSORPTION AND DESORPTION IN MINE DRAINAGES,
Colorado School of Mines, Golden
For primary bibliographic entry see Field 5B
W79-03673

ACTUAL EVAPOTRANSPIRATION OVER A SUMMER PERIOD IN THE 'HUPSEL CATCHMENT',
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydraulics and Catchment Hydrology

For primary bibliographic entry see Field 2D
W79-03813

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ISOLATION OF A MERCURIC CHLORIDE-TOLERANT BACTERIUM AND UPTAKE OF MERCURY BY THE BACTERIUM,
Gifu Univ. (Japan). Dept. of Agricultural Chemistry
For primary bibliographic entry see Field 5C.
W79-03501

DESIGN AND ANALYSIS OF AQUATIC MONITORING PROGRAMS AT NUCLEAR POWER PLANTS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5G.
W79-03566

AQUATIC AND TERRESTRIAL SURVEYS IN THE VICINITY OF POWER PLANTS USING REMOTE SENSING,
Calspan Corp. Buffalo, NY.
J R Schott, and D W Gaucher
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 463, Price codes: A04 in paper copy, A01 in microfiche. New York State Energy Research and Development Authority, New York, NY., Report NY-SERDA 75 31, April 1977 66 p, 12 fig, 8 tab, 11 ref

Descriptors: Environmental effects, *Monitoring, *Air pollution, *Water pollution, Thermal pollution, Powerplants, Analytical techniques, *Remote sensing, Reflectance, Photometry, Surveys.

This study attempts to define, develop and demonstrate the capabilities of remote sensing for monitoring the effects of stack emissions and thermal discharge on the environment The extent to which the reflectance properties of elements in the environment as measured from aerial photography could be related to the condition of the environment was examined. Program results indicated that vegetative stress in a forested environment can be related to reflectance signatures as measured from aerial imagery. In water quality studies, relationships between reflectance and chlorophyll concentration, suspended material and yellowing organics were shown. Data collected from aerial and boat measurements and combined with laboratory modeling showed that measurement of certain effects of thermal discharges on the aquatic environment is possible. (Chilton-ORNL)
W79-03567

EVALUATION OF VINYL CHLORIDE EMISSIONS IN THE LONG BEACH AREA, CALIFORNIA,
National Field Investigations Center-Denver, CO
For primary bibliographic entry see Field 5B.
W79-03577

POLAROGRAPHIC DETERMINATION OF LEAD HYDROXIDE FORMATION CONSTANTS AT LOW IONIC STRENGTH,
Geological Survey, Menlo Park, CA. Water Resources Div
C J Lind
Environmental Science and Technology, Vol 12, No 13, p 1406-1410, December 1978 2 fig, 4 tab, 15 ref

Descriptors: *Lead, *Polarographic analysis, *Freshwater, *Chemical reactions, *Ions, *Aqueous solutions, Chelation, Analytical techniques, Water chemistry, Heavy metals, Trace elements, Pollutants, Graphical methods, Evaluation, *Metal hydroxides, Molecular concentrations, Formation constants.

Values for the formation constants for lead hydroxide complexes containing one, two, and three hydroxide ligands have been determined at 0.01 M ionic strength. These constants can be directly applied to many freshwaters. Generally, however, applications should involve use of the constants corrected to zero ionic strength by using appropriate activity coefficients corresponding to the ionic strength of the solution being considered. (Woodard-USGS)
W79-03592

UTILIZATION OF THE STEAM DISTILLATION PROCEDURE FOR THE DETERMINATION OF METHYL MERCURY IN FISH AND SHELLS BY GAS-LIQUID CHROMATOGRAPHY, (IN JAPANESE),
Yamaguchi Prefectural Research Inst. of Health, (Japan).
H Kumagai, and K Saeki
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 7, p 803-805, 1978. 1 fig, 3 tab, 8 ref

Descriptors: *Mercury, *Gas chromatography, Pollutant identification, Heavy metals, Chlorides, Organic compounds, Chemical analysis, Path of pollutants, Chemical reactions, Absorption, Animal metabolism, Fish physiology, Clams, Oysters, Shrimp, Marine fish, Tissue analysis, *Mercury compounds, *Methylmercury.

In this connection, the steam distillation procedure has been applied for the determination of methyl mercury in fish and shells by gas-liquid chromatography. The procedure adapted herein involves steam distilling volatile alkyl mercurials as mercuric chlorides. The mercuric chlorides in the distillate are extracted with benzene, and the benzene phase is partitioned with a cysteine acetate solution. Methyl mercuric chloride in the aqueous phase is determined by electron capture gas-liquid chromatography using alpha-chloronaphthalene as an internal standard. (EIS-Deal)
W79-03635

CADMIUM AND ZINC IN MUSCLE OF BLUEGILL (LEPOMIS MACROCHIRUS) AND LARGEMOUTH BASS (MICROPTERUS SALMOIDES) FROM AN INDUSTRIALLY CONTAMINATED LAKE,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics
B R Murphy, G J Atchison, and A W McIntosh.
Environmental Pollution, Vol. 17, p. 253-257, 1978. 3 tab, 18 ref.

Descriptors: *Cadmium, *Zinc, *Sunfishes, *Bass, Pollutant identification, Chemical analysis, Heavy metals, Metals, Water chemistry, Public health, Human pathology, Food habits, Fish food organisms, Fish physiology, Animal metabolsm, Industrial wastes, Chemical wastes, Water analysis, Indiana, Palestine Lake, *Tissue analysis, *Bioaccumulation

Cadmium and zinc analyses of 44 largemouth bass and 29 bluegill indicate that fish in an ecosystem heavily contaminated by trace metals accumulate significantly more metal in edible muscle tissue than do fish in an uncontaminated ecosystem. Concentrations detected ranged from 0.010 to 1.308 ppm Cd and 18.2 to 158.2 ppm Zn (dry weight) Blugill contained significantly greater concentration of Cd and Zn than did bass and small bass contained significantly more Cd than did large bass. Human consumption of these fish is probably not a health hazard unless such fish constitute a major protion of the diet. (EIS-Deal)
W79-03640

237PU EXPERIMENTS WITH THE THORNBACK RAY RAJA CLAVATA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England) Fisheries Radiobiological Lab.
R. J. Pentreath
Marine Biology, Vol. 48, p 337-342, 1978. 1 fig, tab, 6 ref

Descriptors: *Radioisotopes, *Tracers, Animal m tabolism, Animal physiology, Chemical analys Radiochemical analysis, Path of pollutants, A sorption, Radiation, Gamma rays, *Plutoniu *Rays, Raja, Tissue analysis, Bioaccumulatic *Depuration, *Transuranic elements

Some experiments have been performed on t metabolism of 237Pu, a high specific activi gamma-emitting isotope of plutonium, by t thornback ray. Unlike previous experiments wi the plaice it was found that the thornback r absorbed plutonium across the gut wall, as read observed by analysis of the liver. The liver acc mulated up to 0.2% of the 237Pu given in a sin labelled meal after a period of 12 days. Dire injection of the isotope into the muscle of tho back rays resulted in extremely slow rates of eli nation from the fish, the highest internal conce trations being attained by the spleen. The larg fractions of the whole-body burden, howev were those of liver and skeleton. (EIS-Deal)
W79-03649

THE SELECTION AND LIMITATIONS PHENOL AS A REFERENCE TOXICANT DETECT DIFFERENCES IN SENSITIVI AMONG GROUPS OF RAINBOW TRO (SALMO GAIRDNERI),
Fisheries and Marine Service, Winnipeg (Mani ba). Freshwater Inst
D G. Alexander, and R. Mc. V. Clarke
Water Research, Vol. 12, p 1085-1090, 1978. 3 t 17 ref

Descriptors: *Phenols, *Rainbow trout, *Bioass Analytical techniques, Laboratory tests, F physiology, Animal metabolism, Sodium co pounds, Copper sulfate, Sulfates, Chlorine, To ity, Mortality, Resistance, Fish behavior, Fish p ulations, *Reference toxicants.

Phenol was better than sodium azide, sodium p tachlorophenate, copper sulphate and dodecy dium sulphate in detecting differences in sensiti among groups of rainbow trout. Phenol detec differences in sensitivity among strains of trout could discern the effects of starvation, temp ture, stress and pre-exposure to 0.04 mg/l-1 c rine on the sensitivity of trout to phenol, but the effects of three brands of food and high mo ity during holding. The sensitivity of rainbow t to phenol was independent of weight and loa density in the bioassays. The use of phenol reference toxicant for the rapid detection of di ences in sensitivity among groups of fish is lim because differences can only be detected by c paring the sensitivity of an unknown group of to that of a known, unstressed group of fish in same bioassay. The concept of a single refere toxicant appropriate for bioassays with a variet chemicals is questionable because differe among groups of fish, which are detectable reference toxicant, may not affect the result bioassays with other chemicals. A series of phy logical and behavioural screening tests and nostic health checks may be more useful reference toxicants to identify groups of fish w should not be used in bioassays. (EIS-Deal)
W79-03655

BENTHIC MACROINVERTEBRATE COM NITIES OF THE PENOBSCOT RIVER, MA WITH SPECIAL REFERENCE TO TH ROLE AS WATER QUALITY INDICATORS,
Maine Univ. at Orono
C F Rabeni
Available from the National Technical Informa Service, Springfield, VA 22161 as PB-290 Price codes: A08 in paper copy, A01 in microfi PhD Thesis, January 1977 169p, 15 fig, 7 ta ref, 7 append OWRT A-028-ME(2)

Descriptors: *Bioindicators, Invertebrates, A sis, Classification, Current velocity, Detritus,

solved oxygen, Invertebrates, Pulp and paper effluents, Rivers, Sampling, Standing crops, Trbidity, Water chemistry, Water quality, Water temperature, *Maine, Pollutant identification, *Penobscot River(ME), *Benthic macroinvertebrates, Bray-Curtis ordination, Hess sampler, Pollution-stressed/clean water communities, Siltation, Water depth.

This study was designed to develop a system for using benthic macroinvertebrates as water quality indicators in a large deep river. Project objectives were: (1) to develop reliable sampling techniques; (2) to determine whether pollution-stressed communities were predictively differently from clean water communities; and (3) to determine the range of, and environmental factors responsible for, variations in the structures of clean water communities. Two sampling methods were of value--(1) a modified Hess sampler which obtained a more representative sample of actual standing crop, and (2) rock-filled baskets secured to the river bottom, which collected a greater number of individuals and taxa. Indicator organisms were not particularly sensitive, and species diversity was often misleading. An efficient water quality classification system was developed using the Bray-Curtis ordiantion, which was sensitive to changes in the faunal community structure caused by pulp and paper mill effluents. Invertebrates were better indicators of certain types of pollution than were standard physical and chemical methods. Analysis also indicated that the composition of clean water invertebrate communities were partially determined by current velocity, siltation, and organic detritus, and was not affected by water temperature, turbidity, dissolved oxygen, water depth, and water chemistry.
W79-03669

EFFECTS OF TRACE ELEMENTS ON NITRIFICATION IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
C. N. Liang, and M. A. Tabatabai.
Journal of Environmental Quality, Vol. 7, No. 2, p. 291-293, April-June, 1978. 3 tab, 15 ref.

Descriptors: *Nitrification, Inhibitors, Nitrates, Nitrites, *Trace elements, *Heavy metals, Pollutants.

Studies to evaluate the effects on nitrification of 19 trace elements showed that all these elements inhibited nitrification of NH4(+)-N added to soils. Results showed that the relative effectiveness of the trace elements in inhibition of nitrification depends on the soils. When the trace elements were compared to using 5 micromoles/g of soil, Ag(I), Hg(II), Cd(II), As(III), Cr(III), B(III), Al(III), Se(IV), and Mo(VI) were the most effective inhibitors (average inhibition less than 50 percent), and Mn(II) and Pb(II) the least effective (average inhibition greater than 25 percent) inhibitors. The average inhibition by the elements Co(II), Cu(II), Sn(II), Fe(II), Zn(II), Fe(III), V(IV), and W(VI) ranged from 33 percent with W(VI) to 49 percent with Fe(III). Silver(I), Ni(II), Co(II), Zn(II), Mn(II), Pb(II), As(III), B(III), Fe(III), As(V), Mo(VI), and W(VI) inhibited Nitrobacter, causing accumulation of NO2(-)-N in one of the soils used. (Skogerboe-Colorado State)
W79-03705

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. G. Harrison, R. W. Eppley, and E. H. Renger.
Bulletin of Marine Science, Vol 27(1). p 44-57, 1977. 9 tab, 6 fig, 40 ref.

Descriptors: *Phytoplankton, *Nitrogen, *Growth rates, *Copper, *Heavy metals, *Photosynthesis, Toxicity, Mortality, Water pollution effects, Path of pollutants, Resistance, Bioassay, *Plant growth, Plant physiology, On-site-investigation, Metabolism, *Controlled experimental ecosystem, *Nitrogen metabolism, Nitrogen budgets, Noctiluca sp, Nitrate reductase assays, *Nutrient loading.

Phytoplankton growth and nitrogen metabolism seemed typical of coastal temperate plankton in the 0.25-scale CEPEX enclosures used at Saanich Inlet, B.C., in the summer of 1974. Maximum rates of nitrogen assimilation corresponded to a growth rate of about 1.0 day-1 and half-saturation rates on a day-to-day basis were regulated primarily by ambient nitrate and ammonium levels, overall phytoplankton levels and settlement rates were related to the rate of nutrient loading. Remineralization of nitrogen to ammonium was rapid and important. Although only nitrate (along with phosphate and silicate nutrients) were added to the enclosures, rates of ammonium assimilation by the phytoplankton were similar to those for nitrate. Several actute effects of copper on phytoplankton were observed, including inhibition of nitrate uptake, photosynthetic carbon assimilation, synthesis of nitrate reductase, and cell disruption and loss of accumulated ammonium in Noctiluca sp. Evidence suggests that the addition of copper to the enclosures resulted in acute inhibition of phytoplankton growth and replacement of the initial phytoplankton by a copper-tolerant assemblage. Bioassay experiments indicated that even after the shift to copper-tolerant forms, (1) the copper in the enclosures remained in a chemical form still toxic to phytoplankton from control enclosures, and (2) the degree of copper-tolerance of the phytoplankton was related to ambient copper concentrations. (Katz)
W79-03738

A GEOCHEMICAL STUDY OF A MARSH ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2K.
W79-03743

ROLE OF INORGANIC CARBON AVAILABILITY IN THE FORMATION OF NUISANCE BLOOMS OF BLUE-GREEN ALGAE,
Oklahoma State Univ., Stillwater. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03762

EFFECTS OF POLYCHLORINATED BIPHENYL COMPOUNDS AND PROPOSED PCB-REPLACEMENT PRODUCTS ON EMBRYO-LARVAL STAGES OF FISH AND AMPHIBIANS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5C.
W79-03763

DETERMINATION OF PHOSPHATE BY CATHODIC STRIPPING CHRONOPOTENTIOMETRY AT A COPPER ELECTRODE,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
G. L. Lundquist, and J. A. Cox.
Analytical Chemistry, Vol. 46, No. 3, p. 360-364, March 1974, 4 fig, 4 tab. OWRR A-041-ILL(2), USDI 14-31-0001-3213.

Descriptors: *Phosphates, *Trace elements, *Electrodes, *Electrochemistry, *Pollutant identification, Electriochemical stripping, Electrolysis potential, Copper electrode.

A method for the determination of phosphate based upon stripping of an electrochemically deposited cupric phosphate film has been developed. The film consists of a mixture of Cu(II) salts of the conjugate bases of H3PO4 with the HPO 4(2-) salt being the major component in the analytical pH range. Linear working curves over single orders-of-magnitude down to 20 ppb phosphate have been obtained. The percent standard deviation varies from 20% to 20 ppb to within 3% at concentrations above 1 ppm. The detection limit is 10 ppb when a 20-minute electrolysis is used. Chemical dissolution of the film in competition with electrochemical stripping and the appearance of a blank transition due to reduction of cupric ion in the reaction layer establish the detection limit.
W79-03769

VOLTAMMETRIC DETERMINATION OF TRACE QUANTITIES OF NITRATE IN AN ANION EXCHANGE MEMBRANE ISOLATED CELL,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
G. L. Lundquist, G. Washinger, and J. A. Cox.
4-31-0001-3213.

Descriptors: *Nitrates, Analytical techniques, *Volumetric analysis, Membranes(Anion exchange), *Pollutant identification, Water analysis, Electrolysis, Electrolytes.

Polarographic and spectrophotometric methods for the determination of trace quantities of nitrate have significant limitations for field investigations. The proposed method is based upon the reduction of nitrate by linear potential scan voltammetry at a stationary mercury drop electrode in a small volume electrolysis cell. The cell is isolated from the test solution by an anion exchange membrane. The membrane serves to preconcentrate the nitrate in the electrolysis chamber and also prevents net loss of the supporting electrolyte from the chamber. Hence, a dip-type system may be designed for direct voltammetric measurements in low ionic strength media. Experimental results demonstrate that linear scan voltammetry determinations in samples of low-to-moderate ionic strength. Surfactants, chloride and cations do not interfer which makes the method attractive for natural water samples.
W79-03771

WATER SYSTEM VIRUS DETECTION,
National Aeronautics and Space Administration Washington, DC. (Assignee).
J. C. Fletcher, A. S. Fraser, A. F. Wells, and H. J. Tenoso.
U.S. Patent No. 4,118,315, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 975, No. 1, p. 258, October 3, 1978.

Descriptors: *Patents, *Monitoring, *On-site tests, *Water quality control, Recirculated water, Reclaimed water, Water reuse, Viruses, Performance, Pollutant identification.

In a closed environment system, such as exists in a spacecraft, it is necessary to recycle waste products to the maximum extent. Water is a particular commodity which must be recycled. The object of this invention is to monitor the performance of a waste water reclamation system whereby early detection of any system malfunction is obtained. The performance is monitored by introducing a non-pathogenic marker virus, bacteriophage F2, into the waste-water prior to treatment and, thereafter, testing the reclaimed water for the presence of the marker virus. A test sample is first concentrated by absorbing any marker virus onto a cellulose acetate filter in the presence of a trivalent cation at low pH and then flushing the filter with a limited quantity of a glycine buffer solution to desorb any marker virus present on the filter. Photo-optical detection of indirect passive immune agglutination by polystyrene beads indicates the performance of the water reclamation system in removing the marker virus. A closed system provides for concentrating any marker virus, initiating and monitoring the passive immune agglutination reaction, and then flushing the system to prepare for another sample. Peristaltic pumps are provided for volumetric control and for positive fluid displacement. Solenoid valves direct the output from the pumps in preselected routes to accomplish the process for concentrating and detecting the marker virus. (Sinha-OEIS)
W79-03784

SCENARIO FOR AN ONGOING CHLOROPHYLL A SURVEILLANCE PLAN ON LAKE ONTARIO FOR NON-INTENSIVE SAMPLING YEARS,
Canada Centre for Inland Waters, Burlington (Ontario).

R. E. Kwiatkowski.
Journal of Great Lakes Research, Vol. 4, No. 1, p 19-26, March 1978. 4 fig, 3 tab, 21 ref.

Descriptors: *Sampling, *Canada, *Chlorophyll, *Lake Ontario, Surveys, Data collections, On-site investigations, Data processing, Statistics, Seasonal, Distribution patterns, Lakes, Nutrients, Water quality.

This study proposed an effective, non-intensive sampling program for chlorophyll a on Lake Ontario. Three years of chlorophyll data were used to establish three statistically homogeneous zones, significantly different at the 5% level. These zones were referred to as offshore, inshore, and point source areas. The seasonal cycle for each zone was presented as was the number of samples needed to estimate the mean of each zone within 1%, 5%, and 10% of the true mean, with a 95% confidence level. (Sims-ISWS)
W79-03808

MIREX IN THE SEDIMENTS OF LAKE ONTARIO,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab
For primary bibliographic entry see Field 5B.
W79-03810

SAMPLING OF GROUNDWATERS FOR CHEMICAL ANALYSIS,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2K
W79-03822

SYMPOSIUM: EXPERIMENTAL USE OF ALGAL CULTURES IN LIMNOLOGY; SANDEFJORD, NORWAY, 26-28 OCTOBER 1976.
Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Stuttgart (Germany, F.R.).
For primary bibliographic entry see Field 5C.
W79-03842

ALGAL ASSAY PROCEDURE WITH ONE OR FIVE SPECIES. MINITEST.
Uppsala Univ. (Sweden). Algal Assay Lab
A. Clasesson, and A. Forsberg.
In: Syposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittellungen No 21, June 1978, p 21-30. 6 fig, 2 tab, 13 ref

Descriptors: *Testing procedures, *Bioassay, *Methodology, *Minitest, *Bottle test, *Algae, Cultures, Selenastrum capricornutum, Ankistrodesmus falcatus, Chlorella homosphaera, Euglena gracilis, Scenedesmus quadricauda, Plant growth, Toxicity, Waste water(Pollution), Algal growth potential, Limiting factors, Carbon, Water pollution effects, Lakes, Eutrophication.

A miniature version of the standard algal assay bottle test, called the Minitest, yields results essentially the same as with the conventional test, which must be modified for large-scale screening application. Minitests are performed in small plastic tubes containing a culture volume of 2.5 ml. This paper describes two Minitest methods: (1) Selenastrum capricornutum as a single test alga, routinely used for determining maximum algal growth potential (AGP) and limiting nutrients in lake water; and (2) a combination of S. capricornutum, Ankistrodesmus falcatus, Chlorella homosphaera, Euglena gracilis, and Scenedesmus quadricauda mixed on an equal cell volume basis, used to estimate AGP and indicate toxic effects of wastewater. All algae are axenically grown in Z8 medium except Euglena, grown in Wolken's medium (1961). Preparation of the inoculum involves three phases: (1) stock cultures kept one week in 20% Z8 or Euglena medium in E-flasks; (2) starving in P-free, N-poor medium for one week; and (3) mixing of starved algae on an equal cell volume basis, giving a 'standard recipient.' Incubation is normally three days for wastewater and two weeks for lake water. Whereas carbon deficiency is common in algal assays, Minitest cultures did not require carbon dioxide bubbling or HCO3 enrichment when punched stoppers were used. (See also W79-03842) (Lynch-Wisconsin)
W79-03844

THE CULTURE COLLECTION POINT OF VIEW.
Culture Centre of Algae and Protozoa, Cambridge (England).
E. A. George
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No 21, June 1978, p 31-33.

Descriptors: *Cultures, *Algae, *Testing, *Storage, *Basic data collections, Methodology, Classification, Chlorella, Storage, Storage requirement, Nitrogen, Freeze drying, Culture media, Service collections, Data processing, Bacteria, Fungi, Protozoa, Survival.

Techniques of maintaining service collections of algae, fungi, or bacteria are described. A service-oriented collection should maintain and supply all worthwhile cultures within its interest area and collects and supplies information relating to them. Most strains are either taxonomic types or the subjects of other published research. Essential or valuable procedures include: (1) recording of full and accurate data when a strain is deposited, (2) careful labelling, (3) keeping a record of issue of strains, (4) reference to strains in publications, and (5) maintenance of a collection of user publications. Most algal strains are maintained as active cultures needing subculturing every few months or even weeks, but progress is being made towards preservation by freezing or drying. The Culture Centre of Algae and Protozoa (Cambridge, United Kingdom) now has all of its Chlorella strains and many other Chlorococcales under liquid nitrogen, and survival is usually over 90%. The main external factors affecting survival are growth temperature prior to freezing, age of cultures, possible use of protective additives, and rate of cooling and thawing. The World Federation of Culture Collections has published a world directory of data on culture collections and of the species they hold, and are now in the process of banking data on every strain in culture. (See also W79-03842) (Lynch-Wisconsin)
W79-03845

PHYSIOLOGICAL INDICATORS OF NUTRIENT DEFICIENCY IN ALGAE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
F. P. Healey.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No 21, June 1978, p 34-41. 5 fig, 7 ref.

Descriptors: *Algae, *Plant physiology, *Bioindicators, *Nutrient deficiency, *Limiting factors, *Methodology, Analytical techniques, Nutrients, Essential nutrients, Anabaena variabilis, Canada, Lakes, Cultures, Phosphorus, Nitrogen, Phosphates, Phosphatases, Metabolism, On-site tests.

Cultural studies have shown that a number of kinds of algae respond in a qualitatively manner to nutrient deficiencies. This paper demonstrates that: (1) such qualitative generalizations can be converted into quantitative terms for most algae, and (2) the cultural data is comparable to data for natural populations and can be used to quantify nutrient deficiencies in natural populations. Phosphorus deficiency generally lowers phosphorus content, and causes increased alkaline phosphatase activity and ability to take up phosphate. Nitrogen deficiency lowers the nitrogen content, while increasing the ability to take up ammonium. Lowered chlorophyll and protein with raised carbohydrate contents are general responses to nutrient deficiency. Physiological responses to phosphorus deficiency is illustrated using Anabaena variabilis. Effects of nutrient deficiency on nitrogen and phosphorus content of a variety of algae are described and figured; algal types include chlorophytes, cyanophytes, diatoms, chrysophytes, and dinoflagellates. Indicators of nutrient deficiency taken from cultural studies are then compared with results of field studies conducted at several central Canadian lakes, including the south basin of Lake Winnipeg, South Indian Lake, and a small prairie lake in Manitoba. (See also W79-03842) (Lynch-Wisconsin)
W79-03846

A MODIFIED TURBIDOSTATIC SYSTEM FOR ALGAL POPULATION STUDIES,
Euratom European Community, Varese (Italy)
G. Premazzi, O. Ravera, and A. Lepers.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No 21, June 1978, p 42-49. 6 fig, 2 tab, 7 ref.

Descriptors: *Algae, *Phytoplankton, *Turbidostats, *Bioassay, *Testing procedures, *Laboratory equipment, Research equipment, Methodology, Continuous flow, Pollutants, Selenastrum minitum, Primary productivity, Cadmium, Nutrients, Culture media, Chlorophyta

A new type of turbidostat has two important advantages: (1) population density is controlled by a photodetector sensor with one threshold, and (2) the difference between the photoelectrical relays is minimized. In addition to comparing the growth rate of algal populations cultivated on media with different macro- and micro-nutrients, the system may record quantitatively and continuously the effects of any pollutant on the primary production of algal populations. The system is illustrated with an experiment on effects of low concentrations of cadmium salts on a population of the chlorophyte Selenastrum minutum. Variation in population density is the most common parameter used to measure effects of a pollutant, and planktonic algae and other microorganisms with a fast turnover rate are often used to assay pollutants. A turbostat controls growth internally--rate of flow is controlled by cell density. Essential features of a turbidostat include (1) an optical balance which compares the optical density of the culture with that of a reference, and (2) a feed-back loop by which a voltage signal operates on an on-off valve in a fresh medium line. The new turbidostat comprises a culture vessel in which cells are grown isolated from contamination, a nutrient supply system, a culture agitation system, an optic-electronic system with a photodetector to monitor population density, and a system of drainage that removes fluid from the culture vessel as the same rate as the fresh medium is supplied. (See also W78-03842) (Lynch-Wisconsin)
W79-03847

SOLUBILIZATION OF BIOLOGICALLY AVAILABLE PHOSPHORUS BY AUTOCLAVING SELENASTRUM.
FMC Corp., Princeton, NJ. Research and Development Dept.
J. Saldick, and J. F. Jadlocki, Jr.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No 21, June 1978, p 50-56. 4 tab, 5 ref.

Descriptors: *Selenastrum capricornutum, *Phosphorus, *Bottle test, *Bioassay, *Autoclave, *Testing procedures, Solubility, Plant growth, Phytoplankton, Algae, Nutrients, Phosphates, Methodology, Limiting factors, Eutrophication, Lakes, Streams, Chlorophyta

EPA's manual for use of the algal assay bottle test in studies of the nutritional state of lakes and streams recommends either filtration alone or autoclaving for sample pretreatment before inoculation with test algae. The present experiments were undertaken to measure the fraction of algal cell phos-

phorus that would be released by autoclaving and made available for growth of the chlorophyte Selenastrum capricornutum in the bottle test. It is concluded that the nutritional state of algae present in test water samples influences results and must be considered in interpretation. Autoclaving solubilized 70-85% of the phosphorus contained in Selenastrm but only 15-45% appeared as soluble reactive phosphorus (SRP). The soluble but nonreactive phosphate (total soluble phosphorus minus SRP) was generally not available for cell replication in 21 days in the bottle test, but there were some exceptions in which a portion of this fraction was used. SRP was consistently available in the 21-day bottle test. Retardation of growth rate due to removal of essential micronutrients other than iron was observed when the cell population at the time of autoclaving was sufficiently high. Recently acquired surplus phosphorus was released as SRP in greater yield (about 50%) by autoclaving than older surplus phosphorus. To the extent that Selenastrum is a typical alga, autoclaving of natural waters containing other algae will be given similar phosphorus solubilization. (See also W79-03842) (Lynch-Wisconsin)
W79-03848

CULTURES OF CLADOPHORACEAE IN WATER POLLUTION PROBLEMS,
Zurich Univ. (Switzerland). Pflanzenbiologisches Inst.
F. Schanz, and E. A. Thomas.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 57-64. 5 fig, 1 tab, 19 ref.

Descriptors: *Cladophoraceae, *Cladophora, *Rhizoclonium, *Eutrophication, *Test organisms, Algae, Water pollution control, Nutrients, Culture media, Testing procedures, Toxicity, Lead, Cadmium, Copper, Zinc, Heavy metals, Chlorophyta.

Numerous experiments show Cladophoraceae (Chlorophyta), especially Cladophora and Rhizoclonium to be good test organisms for water pollution control studies, because yield of the alga is dependent on several factors associated with eutrophication; these include nutrient salt concentration, extracellular products of bacteria, thiamine concentration, and sensitivity to several heavy metals. Growth experiments were conducted with axenic cultures of Cladophora (zinc and copper) and Rhizoclonium (zinc, copper, lead, and cadmium) to detect effects of heavy metals. Toxic concentrations were: zinc 0.1 mg/l, copper 0.05 mg/l, lead 1.2 mg/l, and cadmium 0.01 mg/l. Tests of effects of lead concentration on Rhizoclonium growth showed that only 50-80% is available to the alga, with the rest eliminated by precipitation or absorption. Maximum concentration of lead in Rhizoclonium experiments was 10,000. The quantity taken up by algae dependend linearly on the added lead concentration. Cladophoraceae are among dominant algae growing on the shores of lakes and rivers, and among them Cladophora and Rhizoclonium have the highest mass production. Laboratory populations as yet have not been brought to the level of growth found in nature. Cladophoraceae prefer an environment with relatively high concentrations of nutrient salts; they will not grow in synthetic nutritive solutions, requiring certain bacteriologically produced substances for growth. (See also W79-03842) (Lynch-Wisconsin)
W79-03849

COMPARISON OF BIOASSAY PROCEDURES FOR GROWTH-LIMITING NUTRIENTS IN THE LAURENTIAN GREAT LAKES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, E. D. Rothman, and M. S. Simmons.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 65-80. 6 fig, 8 tab, 11 ref. EPA 800965.

Descriptors: *Great Lakes, *Bioassay, *Testing procedures, *Limiting factors, *Phytoplankton, *Nutrients, Algae, Lake Michigan, Lake Huron, Lake Erie, Methodology, Phosphorus, Silica, Nitrogen, Chlorophyll, Eutrophication, Oligotrophy, Population dynamics, Analytical techniques, Lakes, Water pollution effects, Selenastrum.

Three bioassay procedures for growth-limiting nutrients are compared using water samples from lakes Erie, Michigan, and Huron; both natural phytoplankton populations and unialgal culture of Selenastrum capricornutum were used as bioassay organisms. The three procedures are: (1) a fixed-level experiment with natural phytoplankton assemblages, (2) a spiked test with natural phytoplankton assemblages, and (3) a spiked test with the Chlorophyte Selenastrm. Changes in chlorophyll standing crops are usually used to determine effects of treatments on algal growth. Results indicate that: (1) bioassay techniques can be used to determine if added substances will affect phytoplankton growth in oligotrophic waters; (2) measurable responses can be obtained from spiked experiments with additions as small as 1.0 micrograms P/l; and (3) natural populations can be effectively used to determine growth-limiting nutrients, and provide important ecological data on population dynamics not possible using maintained algal cultures. Investigation of effects of phosphorus, nitrogen, and silicon demonstrate that phytoplankton in Lakes Huron and Michigan are phosphorus limited, but not in Lake Erie. Water samples ranged from highly eutrophic (western Lake Erie) to relatively oligotrophic (Lake Michigan and Lake Huron). In the tests nutrient levels were ambient, plus three additions of phosphorus ranging from 5-15 micrograms/l, two additions of silica at 0.8 and 1.6 mg SiO2/l, and one addition of nitrate at 0.3 mg N/l. (See also W79-03842) (Lynch-Wisconsin)
W79-03850

PRINCIPAL ASPECTS CONCERNING THE BATCH TECHNIQUE IN ALGAL ASSAYS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
E. Steemann-Nielsen.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 81-87. 6 fig, 8 ref.

Descriptors: *Batch cultures, *Bioassay, *Testing procedures, *Methodology, *Algae, *Eutrophication, Cultures, Photoperiodism, Phytoplankton, Selenastrum capricornutum, Nitzschia palea, Standing crops, Nutrients, Toxicity, Water pollution effects, Analytical techniques, Plant growth, Growth rates, Chlorophyta, Diatoms, Chrysophyta.

Batch culture algal assays can be used to investigate: (1) effects of nutrient concentration on maximum algal standing stock, (2) growth inhibition due to toxicity, and (3) influence of nutrient concentration on growth rate. There are often three phases in the development of a batch culture: (1) an initial lag phase where the growth rate gradually increases, (2) the logarithmic growth phase in which there is a constant growth rate representing maximum reproductive capacity, and (3) a stationary phase where the growth rate gradually decreases to zero. Such types of batch cultures should only be used where maximum algal standing stock is desired; a technique is presented in which the alga grows at a constant rate during the entire experiment. The inoculum must be taken from a culture grown under conditions identical with experimental conditions and when the culture is still in the logarithmic growth phase. Very dilute suspensions of the alga (the same order as found in natural noneutrophic habitats) are necessary for investigating effects of nutrient concentration for ecological purposes, and the algal uptake rate of the nutrient must be sufficiently small so that its concentration does not perceptibly decrease during the experiment. A higher algal concentration can be used in studies of the influence of toxic substances. Continuous irradiance is generally used with batch cultures. In this study, the chlorophyte Selenastrum capricornutum and the diatom Nitzschia palea were used. Counting techniques are discussed. (See also W79-03842) (Lynch-Wisconsin)
W79-03851

GROWTH OF OSCILLATORIA AGARDHII IN CHEMOSTAT CULTURE. 2. DEPENDENCE OF GROWTH CONSTANTS ON TEMPERATURE,
Uppsala Univ. (Sweden). Inst. of Limnology.
G. Ahlgren.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 88-102. 10 fig, 3 tab, 25 ref.

Descriptors: *Temperature, *Oscillatoria agardhii, *Chemostats, *Growth rates, *Bioassay, *Absorption, Batch cultures, Plant growth, Algae, Half-saturation constant, Phosphorus, Nitrogen, Maximum specific growth rate, Specific growth rate, Yield coefficient, Limiting factors, Nutrients, Cyanophyta.

Part I of this study investigated growth constants of the cyanophyte Oscillatoria agardhii at room temperature. This paper examines variation in those constants at different temperatures. Constants considered were: (1) maximum specific growth rate (maximum mu); (2) half-saturation constant for nitrogen and phosphorus (K sub s); and (3) yield coefficient (Y), e.g., the amount of cell mass produced per unit amount of nutrient used. Batch assays were carried out at temperatures of 12-28C and chemostat tests at 15, 20, and 25C. In batch assays, optimum temperature for maximum mu of O. agardhii was 23-25C at alight intensity of 37 microEinstens/sq m/sec. In chemostat tests, mean value of phosphorus contents (q sub p) at 15C was about twice the mean value at 25C (0.56 and 0.26% phosphorus of dry wt), while at 20C the mean value was 0.37%. Thus at lower temperatures algae appear to require a higher phosphorus content than at higher temperatures for the same growth rate. Y appears to be less influenced by temperature than phosphorus content is, and inversely; mean value of Y at 15 and 25C differs by only 25%. K sub s had a minimum at 20C, with only one-third the values at 15 and 25C, but inaccuracy of the methodology at very low concentrations may be responsible. It has previously been found that maximum nitrogen uptake rate (V sub max) varies with both light and temperature, while the half-saturation constant for uptake (k sub s) varies only with temperature. (See also W79-03842) (Lynch-Wisconsin)
W79-03852

THE EFFECTS OF SOME METALLIC IONS ON THE GROWTH OF CHLAMYDOMONAS VARIABILIS AND EUGLENA GRACILIS,
Paris-11 Univ. (France).
For primary bibliographic entry see Field 5C.
W79-03853

NUTRIENT KINETICS OF FRESHWATER PLANKTONIC ALGAE USING BATCH AND SEMICONTINUOUS METHODS,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
S. S. Kilham.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 147-157. 6 fig, 31 ref. NSF OCE 76-10183.

Descriptors: *Nutrients, *Kinetics, *Phytoplankton, *Batch cultures, *Testing procedures, *Monod equation, *Variable internal stores model, Algae, Diatoms, Cultures, Absorption, Methodology, Analytical techniques, Model studies, Mathematical models, Laboratory tests, Equations,

Limiting factors, Freshwater, Limnology, Michaelis-Menten equations, Semicontinuous cultures, Plant growth, Growth rates.

The Monod constant yield model and the variable internal stores model - both of which relate external nutrient concentration to the growth rate of phytoplankton - are outlined and compared both mathematically and experimentally, using published data on planktonic diatoms. The Monod model is a direct measurement of the relationship; the variable internal stores model is a two-step process explaining that relationship through an uptake step (described by the Michaelis-Menten equation) and a utilization step (which evaluates the relationship between internal cell quota of a nutrient and the steady-state growth rate). The two models provide comparable information on the dependence of the growth rate on external nutrient concentration. Although the Monod model is not as physiologically sophisticated as the variable internal stores model, it does provide basic kinetic information needed to evaluate growth response to external nutrient concentrations. Uptake kinetics alone cannot be used to predict the outcome of competition between two species, nor does knowledge of the uptake process alone provide sufficient information to evaluate the growth potential of an algal population. Several variables may affect use of kinetic information to interpret field data: temperature, light intensity, day length, clonal variability, and physical mixing processes and sinking. Algal growth rate appears to be controlled by only one nutrient at a time. Use of short-term batch cultures is a satisfactory shortcut for studying nutrient kinetics. (See also W79-03842) (Lynch-Wisconsin)
W79-03857

THE VARIABLE CHLOROPHYLL-A FLUORESCENCE AS A MEASURE OF PHOTOSYNTHETIC CAPACITY IN ALGAE,
Oslo Univ. (Norway). Botany Lab.
G. Samuelsson, G. Oquist, and P. Halldal.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 207-215. 7 fig, 7 ref.

Descriptors: *Photosynthesis, *Algae, *Chlorophyll, *Fluorescence, *Primary productivity, *Analytical techniques, Chlorella pyrenoidosa, Scenedesmus obtusiusculus, Methodology, Measurement, Pigments, DCMU, Herbicides, Research equipment, Carbon radioisotopes, Chlorophyta.

Variable fluorescence is a promising indirect measure of algal primary production and photosynthetic capacity, based on experiments in which the herbicide DCMU was added to cultures of the chlorophytes Chlorella pyrenoidosa and Scenedesmus obtusiusculus to achieve maximum in-vivo chlorophyll-a fluorescence. DCMU inhibits photosynthesis, halts all electron transport, and causes maximum fluorescence. Photosynthesis was measured by a modified carbon-14 fixation method. If the fluorescence method proves satisfactory, the time-consuming Winkler and Carbon-14 methods can be bypassed. Once a sample is collected, a complete fluorescence reading may be performed in less than five minutes, providing information on both chlorophyll content and photosynthetic capacity. Samples may also be stored for several hours in a dark, cold place without affecting accuracy. Two sources of error must be dealt with: (1) the variable component of fluorescence can produce errors of up to 50%, and instruments should be calibrated on the basis of the stable maximum readings obtained through DCMU inhibition; and (2) when chlorophyll extraction is part of the analysis, chlorophyll and its derivatives from inside animals will distort in-vivo fluorescence measurements. The high light level in the commercially available fluorometer used caused excitation above saturation, and to correct this, light intensity was reduced to 20% and exposure increased from one to five seconds. (See also W79-03842) (Lynch-Wisconsin)
W79-03863

THE BIOGEOGRAPHY OF HOT SPRINGS ALGAE THROUGH ENRICHMENT CULTURES,
Oregon Univ., Eugene. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03871

THE USE OF SELENASTRUM CAPRICORNUTUM BATCH CULTURES IN TOXICITY STUDIES,
Instituto di Ricerca Sulle Acque, Brugherio (Italy).
G. Chiaudani, and M. Vighi.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 316-329. 2 fig, 6 tab, 20 ref.

Descriptors: *Toxicity, *Heavy metals, *Selenastrum capricornutum, *Batch cultures, *Bottle tests, *Bioassay, *Testing procedures, Algae, Phytoplankton, Chlorophyta, Methodology, Italy, Lakes, Water pollution effects, Water pollution control, Culture media, AAP medium, EDTA, Bioindicators.

The Algal Assay Bottle Test of the U.S. Environmental Protection Agency was successfully modified for use with the chlorophyte test alga Selenastrum capicornutum in predicting or assessing heavy metal toxicity in natural waters. Overall conclusions: (1) Selenastrum capricornutum is extremely sensitive to heavy metals and can be considered a good choice for toxicity bioassay. (2) The standard algal assay bottle test with a few modifications can be applied successfully as a reliable screening test for obtaining information on concentrations of various substances likely to be hazardous to phytoplankton. (3) Chemical analysis of complex wastewaters or natural waters receiving wastes is often inadequate for predicting toxicity; it is therefore useful to combine chemical analysis with biological tests. (4) Data is needed on the application of the Selenastrum test (especially in natural waters) before it can be widely used as a standard method for toxicity evaluation. Several experiments were performed in this study to: (1) verify Selenastrum sensitivity to heavy metals in a medium without EDTA; (2) assess toxic effect of heavy metals in the normal AAP medium; (3) evaluate use of the standard algal assay to predict potential toxicity of heavy metals in natural waters of different chemical composition, based on bioassays with water samples taken from 22 Italian lakes during spring overturn; and (4) demonstrate usefulness of the Selenastrum test to assess toxicity in natural waters. (See also W79-03842)(Lynch-Wisconsin)
W79-03872

EFFECTS OF DIFFERENT PROCESS WASTES AND MAIN SEWER EFFLUENTS FROM PULP MILLS ON THE GROWTH AND PRODUCTION OF ANKIISTRODESMUS FALCATUS VAR. ACICULARIS (CHLOROPHYTA),
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03874

WATER CHEMICAL ANALYSES AND/OR ALGAL ASSAY. -- SEWAGE EFFLUENT AND POLLUTED LAKE WATER STUDIES,
Uppsala Univ. (Sweden). Inst. for Physiological Botany.
C. Forsberg, S. O. Ryding, A. Claesson, and A. Forsberg.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereiningung Theoretische und Angewandte Limnologies, Mittelungen No. 21, June 1978, p 352-363. 2 fig, 2 tab, 59 ref.

Descriptors: *Chemical analysis, *Bioassay, *Phytoplankton, *Eutrophication, *Testing procedures, *Algal growth potential, *Limiting factors, Algae, Sewage disposal, Water pollution effects, Sweden, Selenastrum capricornutum, Chlorophyta, Nutrients, Nitrogen, Phosphorus, Lake restoration, Batch cultures.

Results from use of algal bioassays in stuides since 1972 of the recovery of eutrophic lakes in Sweden are compared with information obtained by chemical analysis of water, with special reference to the concept of algal growth potential (AGP) and most-limiting nutrient. For some lakes having comparatively low chlorophyll content, AGP could be determined equally well either by algal assay or by water chemical analysis. For more eutrophic lakes, algal assay AGP was often much higher than the calculated value, partly because thawing frozen water samples increased dissolved organic nutrients, in turn increasing algal growth and overestimating AGP in very eutrophic lakes. Calculating AGP from water chemical data ignored dissolved organic nutrients, thus leading to underestimations. Algae assays performed with lake water involved only the chlorophyte Selenastrum capricornutum with a modified batch culture technique. For assays of sewage effluent five species were uses: a mixed culture of Ankistrodesmus falcatus, Chlorella sp., Euglena gracilis, Secendesmus quadricauda, and Selenastrum capricornutum. Growth-inhibiting or toxic effects are normally difficult to detect by standard chemical analysis, and nutrient bioavailability and growth rate can only be determined by bioassay. Chemical analysis can be satisfactorily used to determine the limiting nutrient when the ratio is high or low, but for situations where nitrogen and phosphorus are in better balance, algal assay helps carify the limiting nutrient. (See also W79-03842). (Lynch-Wisconsin)
W79-03875

THE USE OF NATURAL PHYTOPLANKTON POPULATIONS IN BIOASSAY,
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 364-371. 6 fig, 1 tab, 1 ref. NSF-BM 74-DER 76-19524, NSF-RANN GI 22, AEN 74-22675.

Descriptors: *Phytoplankton, *Lake Tahoe(CA-NV), *Castle Lake(CA), *Nitrogen, *Molybdenum, *Limiting factors, Natural populations, Testing procedures, California, Lakes, Nutrients, Cycling nutrients, Algae, Fragilaria crotonensis, Phosphorus, Nitrates, Diatoms, Oligotrophy, Chrysophyta, Plant growth, Dinobryon, Microcystis aeruginosa, Chroococcus turgidus, Monosiga, Merismopedia convoluta var. minor, Cyanophyta

Natural phytoplankton populations from Castle Lake and Lake Tahoe, California, incubated both in-situ and in a continuous-light incubator, were used in experiments on limiting effects of nitrogen. In environments with extremely low nitrients, as in these lakes, only part-per-billion additions of nutrients are required, and conventional culture technique are not likely to be effective. Adaptation time may be required for enzyme levels to respond to increased substrate levels, and photosynthetic inhibitionis requently the first response measured. In Castle Lake the nitrogen response is complicated by a natural molybdenum deficiency. Culture experiments with natural phytoplankton populations were conducted there to determine the relative availability of nitrogen with and without molybdenum. In early August 1975, fiver micrograms/l of molybdenum was inhibiting with nitrogen and phosphorus in short supply (three micrograms nitrate/l, no detectable ammonia, and two micrograms/l phosphorus). The combination of nitate-nitrogen, phosphorus, and molybdenum was most stimulating, follwed by nitrogen and phosphorus. By early September nitrogen limitation was very pronounced, and the organisms' ability to utilize nitrate without molybdenum was greatly reduced. In Lake Tahoe experiments, Fragilaria crotonenesis, a dominant diatom, showed particular response to nitrate addition in the nitrogen-limiting lake. Various other experiments at the two

lakes are also described. (See also W79-03842). (Lynch-Wisconsin)
W79-03876

USE OF LABORATORY CULTURES OF SELENASTRUM, ANABAENA AND THE INDIGENOUS ISOLATE SPHAEROCYSTIS TO PREDICT EFFECTS OF NUTRIENT AND ZINC INTERACTIONS UPON PHYTOPLANKTON GROWTH IN LONG LAKE, WASHINGTON,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W79-03877

THE APPLICATION OF CULTURE METHODS IN STUDIES OF THE ECOLOGY OF SMALL GREEN ALGAE,
University Coll. of North Wales, Bangor. School of Plant Biology.
C. M. Happey-Wood.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 385-397. 9 fig, 29 ref.

Descriptors: *Testing procedures, *Classification, *Chlorophyta, *Tetrasporales, *Phytoplankton, *Culture media, *Agar, Cultures, Methodology, Algae, Chlorella, Chlamydomonas, Chlamydocapsa bacillus, Phyllocardium, Stigeoclonium, Priddy Pool(England), Abbot's Pool(England), England, Eutrophication, Ponds, Elodea canadensis, Sphagnum, Epiphytes, Epipelic algae, Flagellates, Ecology.

A method of identifying and enumerating small, motile chlorophyte algae (especially the little-studies Tetrasporales) involving culture of field samples on agar plates is described as well as application of the method to algal samples from eutrophic Abbot's Pool and shallow, acid Priddy Pool in Somerset, England. Results show that such algae occur frequently in freshwater algal communities, and that distribution, growth patterns, and periodicity vary among species. Ecological studies will be reported in a future paper. Sample of naturally occurring phytoplankton, epipelic algae, and algae associated with the macrophyts Elodea canadensis and Sphagnum spp. were collected at the two pools, and were incubated on nutrient agar plates (2% concentration) for 14 days. Numbers and types of colonies were counted, and single colonies were isolated and transferred to liquid media for further study and species identification. Genera of small chlorophytes found on the plates included Asterococcus, Carteria, Chlamydocapsa, Chlamydomonas, Chlorella, Chlorococcum, Chlorogonium, Gloeomonas, Gonium, Kirchneriella, Phyllocardium, Scourfeldia, Spermatozopsis, Sphaerellopsis, Sphaerocystis, and occasional colonies of the filamentous Stigeoclonium. Nine species are discussed: Chlorella minutissima, C. vulgaris var. Vulgaris, Chlamydomonas perpusilla, Ch. altered, Ch. sphagnophila, Ch. acutata, Chlamydocapsa bacillusl, Phylocardium sp., and Stigeoclonium sp. (See also W79-03842). (Lynch-Wisconsin)
W79-03878

THE USE OF SMALL, CONTINUOUS AND MULTISPECIES CULTURES TO INVESTIGATE THE ECOLOGY OF PHYTOPLANKTON IN A SCOTTISH SEA-LOCH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
For primary bibliographic entry see Field 5C.
W79-03879

THE FERTILITY OF SOME NORWEGIAN INLAND WATERS ASSAYED BY ALGAL CULTURES,
Norsk Inst. for Vannforskning, Blindern.
J. Kotai, T. Krogh, and O. M. Skulberg.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 413-436. 17 fig, 7 tab, 41 ref.

Descriptors: *Algal growth potential(AGP), *Norway, *Lakes, *Rivers, *Eutrophication, *Bioassay, Selenastrum capricornutum, Algae, Phytoplankton, Chlorophyta, Cultures, Nutrients, Nitrogen, Phosphorus, Plant growth, Lake Mjosa(Norway), Halden watercourse(Norway), Oligotrophy, Water pollution effects.

Some 2000 determinations of algal growth potential (AGP) made in the Ostlandet region of eastern Norway using the chlorophyte Selenastrum capricornutum as the test organism showed that algal growth in naturally oligotrophic inland waters can often be stimulated by small nutrient additions. The fertility of over 400 lakes and rivers in the region (near the Oslofjord) was studied; a selection of the results is presented in tables and figures. Whereas chemical analysis provides data on nutrient concentrations, bioassays are necessary for information on nutrient availability and the capacity of water for sustaining algal growth. Phytoplankton in lakes show seasonal qualitative changes as well as variation in total biomass. In rivers, seasonal variations of AGP are difficult to outline; the annual cycle of plant nutrient abundance is influenced by such external factors as surface drainage and such internal factors as metabolic processes of organisms. The Halden watercourse and Lake Mjosa system are discussed in some detail. In the former, water from oligotrophic-dystrophic Lake Floen flows through the River Holandselv into Lake Bjorkelangen and soutward through a chain of lakes. The water receives municipal sewage and agricultural runoff, resulting in considerable eutrophication, especially downstream of Lake Bjorkelangen. Lake Mjosa, increasingly eutrophic due to urbanization, belongs to the group of Norwegian fjord lakes which are fundamentally oligotrophic. Phytoplankton in the lake are dominated by diatoms. (See also W79-03842) (Lynch-Wisconsin)
W79-03880

SOME ASPECTS ON THE CLASSIFICATION OF NATURAL WATERS BY ALGAL ASSAYS (SGP), PRELUDE,
Helsinki Univ. (Finland). Dept. of Limnology.
P. O. Lehmusluoto.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 437-440. 11 ref.

Descriptors: *Algal growth potential(AGP), *Trophic level, *Methodology, *Classification, *Lakes, *Bioassay, Algae, Limnology, Testing procedures, Water bodies, Nutrients, Eutrophication, Organic matter, Salinity, Dry weight, Indicators.

Algal growth potential (AGP), a measure of nutrient conditions, cannot be used as an indicator of trophic status because trophism refers to the amount of organic matter supplied to a water body per unit time. An AGP test made during the period of growth may be inverse to trophic state measures since it reflects remaining nutrient conditions. Trophic status includes functional and dynamic dimensions, which are not accounted for by AGP. AGP was originally intended for use in eutrophication studies for: (1) assessment of a receiving water's nutrient status and sensitivity to change; (2) evaluation of materials and products for potential effects on algal growth in receiving waters; and (3) assessment of changes in waste treatment processes on receiving waters. In measuring AGP, use of algal dry weight as a parameter should either be avoided or done with care because results may be misleading; salinity-dependent errors may also occur. Dry weight measurements appear reliable if algal mass on the filter is over 1.0-1.2 mg dry wt, usually corresponding to a concentration of more than 3-5 mg dry wt/l. Salt concentration may cause an additional dry weight on the filter when algal populations are not dense. Repeated washing of the filter may reduce salt-dependent dry wt by 50-70%, but some will remain. In addition, algal growth is very sensitive to salinity changes. Brackish water algae grow better at higher salinities. (See also W79-03842) (Lynch-Wisconsin)
W79-03881

PHOSPHORUS AVAILABILITY IN THREE STREAMS DURING STORM EVENTS: CHEMICAL ANALYSIS VS. ALGAL ASSAY,
Kent State Univ., Ohio. Dept. of Biological Sciences.
E. T. Long, and G. D. Cooke.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 441-452. 8 fig, 12 ref. US EPA R801936.

Descriptors: *Bioassay, *Phosphorus, *Storm runoff, *Chemical analysis, *Available phosphorus, *Twin Lakes Watershed(OH), *Streams, *Urban runoff, Ohio, Algae, Selenastrum capricornutum, Chlorophyta, Methodology, Testing procedures, Eutrophication, Lakes, Nutrients, Soluble reactive phosphorus, Total phosphorus, Bottle test, Forest watersheds, Drainage, Land use, Nutrient budgets, Nutrient loading, Bioavailability, Model studies.

Algae bioassay determined biologically available phosphorus contributed to lakes during storms by three streams in northeast Ohio's Twin Lakes Watershed, one draining an urban area, one a forest, and one a lake. Results were compared with chemical determination of total and soluble reactive phosphorus. Conclusions: (1) Because of storm runoff loading rates should be determined according to hydrological rather than calendar events. (2) Land use greatly affected loading rates; urban areas have greater impact than forests or lake drainage. (3) Available phosphorus differs considerably from total phosphorus loading, both during storms and during base flow. (4) Use of biologically available phosphorus in nutrient budgets might enhance predictability of limnological models relating changes in phosphorus income to degree of eutrophication. Chemical determination of phosphorus includes some forms of phosphorus (designated soluble reactive phosphorus) which are functionally inactive in the lake environment. During base flow, available phosphorus made up only a small fraction of total phosphorus; during storms this fraction increased greatly from the urban and forest areas, but not from the lake discharge. Considerably greater amounts of all three forms of phosphorus were contributed during storm runoff from all three areas studied, but the urban area contributed much more of all three phosphorus forms. (See also W79-03842) (Lynch-Wisconsin)
W79-03882

MONITORING THE EFFECTS OF CHEMICAL AND BIOLOGICAL WASTE WATER TREATMENT IN SITU BY DIALYSIS CULTURES OF FRESHWATER ALGAE,
Bergen Univ. (Norway). Inst. for General Microbiology.
M. Laake.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 453-472. 11 fig, 8 tab, 17 ref.

Descriptors: *Dialysis, *Analytical techniques, *Waste water treatment, *Bioassay, *Testing procedures, Algae, Phytoplankton, Scenedesmus quadricuda, Selenastrum capricornutum, Chlamydomonas reinhardtii, Asterionella formosa, Chlorophyta, Heavy metals, Carbon, Chlorophyll, Nutrients, Limiting factors, Phosphates, Norway, Activated sludge, Biological treatment, Cultures, On-site tests.

Four phytoplankton species were used in dialysis cultures to study effects of four biochemical sewage treatment processes at an experimental plant outside Oslo, Norway. Unialgal (Scenedesmus quadricauda) and mixed (Scenedesmus, Selenastrum capricornutum, Chlamydomonas reinhardtii, and Asterionella formosa) cultures were inoculated into twelve 32-ml dialysis bags attached to a rotating wheel submerged in flow-through plastic

boxes exposed to daylight. Growth was measured by optical density at 430 nm. Cells were analyzed for organic carbon, chlorophyll-a and phaeophytin, ATP, and heavy metals (copper, zinc, cadmium, and lead). Types of treated wastewater: (1) secondary Al treatment plus biological oxydation pond (Al + BD); (2) secondary Al treatment (Al); (3) activated sludge biological treatment plus Al (B+ Al); and (4) activated sludge with simultaneous Al-treatment (SIM). SIM generally gave the highest cell yield, with the others more or less equal. ATP content per cell was proportional to wastewater load in mixed cultures, but increased with Scenedesmus along. Mean levels of 0.6 micrograms ATP/mg C confirm phosphate limitation. Chlorophyll was proportional to load for all treatments. Scenedesmus grew better in mixed than in unialgal culture. Algal growth efficiency with phosphate limitation may be ranked as Al + BD, Al, B + Al, and SIM. Heavy metal concentration factors were 1,000,000 for cadmium, 400,000 for lead, and 20,500 for zinc. (See also W79-03842) (Lynch-Wisconsin)
W79-03883

APPLICATION OF ALGAL ASSAYS IN THE ENVIRONMENTAL EVALUATION OF NEW DETERGENT MATERIALS,
Proctor and Gamble Co., Cincinnati, OH. Environmental Safety Dept
A. G. Payne, and R. H. Hall.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 507-520. 17 fig, 10 ref.

Descriptors: *Detergents, *Bioassay, *Trisodium nitrilotriacetate, *Sodium citrate, *Sodium aluminosilicate, *Testing procedures, Algae, Environmental effects, Water pollution effects, Bottle test, Chlorophyta, Cyanophyta, Selenastrum capricornutum, Microcystis aeruginosa, Anabaena flos-aquae, Methodology, Metals, Trace elements, Toxicity, Nutrients, Plant growth, Pollutants, Algistatic concentrations, Burntside Lake(MN), Lake James(NC), Phosphate substitutes, Proctor and Gamble Company.

Algal assays have been used by the Procter and Gamble Company to evaluate environmental safety of potential detergent materials. EPA's algal assay bottle test has been successfully applied by the company (with modifications) to studies of stimulation, chelation, and toxicity using the chlorophyte Selenastrum capricornutum, and the cyanophytes Microcystis aeruginosa and Anabaena flos-aquae. Algal stimulation studies with trisodium nitrilotricetate (NTA) and sodium citrate, under consideration as phosphate substitutes, showed no significant effects on algal growth in representative rivers, lakes, and canals in several localities, including Lake James, North Carolina, Lake Erie, and Lake Michigan. Sodium aluminosilicate (SAS), a potential detergent builder, likewise would not be a significant factor in algal stimulation, toxicity, or general nutrition. At Burnside Lake, Minnesota, addition of NTA and SAS under conditions of adequate nitrogen and phosphorus supply resulted in slight increases in algal growth rates, but no increase in maximum standing crops. The bottle test with M. Aeruginosa was a good techniuqe for trace metal/chelator studies. A toxicity assay procedure using the bottle test is described for determining a test material's algistatic concentration (the level at which there is no net change in algal population.) This criterion is proposed as a less-arbitrary index of algal toxicity than 50% reductions in standing crop (EC50), or growth rate (TL50). (See also W79-03842) (Lynch-Wisconsin)
W79-03887

GROWTH EXPERIMENTS WITH MARINE PLANKTON ALGAE: THE ROLE OF 'WATER QUALITY' IN SPECIES SUCCESSION,
Oslo Univ. (Norway). Dept. of Marine Biology and Limnology.
For primary bibliographic entry see Field 5C.
W79-03888

ALGAL TESTS USED TO STUDY THE CHEMICAL FACTORS REGULATING THE GROWTH OF PLANKTONIC ALGAE IN THE HELSINKI SEA AREA,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
I. Rinne, and E. Tarkiainen.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. International Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 527-546. 2 fig, 14 tab, 23 ref.

Descriptors: *Helsinki(Finland), *Gulf of Finland, *Phytoplankton, *Eutrophication, *Nutrients, *Trace elements, *Bioassay, Algae, Chlorella, Chlorophyta, Nodularia, Cyanophyta, Gulfs, Water pollution effects, Sewage disposal, Vantaa River(Finland), Finland, Coasts, Archipelagos, Limiting factors, Nitrogen, Phosphorus, Plant growth, Water chemistry, Rivers, Statistical methods, Testing procedures.

Chemical factors (nitrogen, phosphorus, and seven trace elements) which regulate phytoplankton growth were studied April-October 1973-75 in the Helsinki sea area of the Gulf of Finland by means of algal assays and analysis of water nutrient content. Assays with the chlorophyte Chlorella sp. and results of ratio tests showed nitrogen more important than phosphorus in regulating growth; however, phosphorus was in short supply during spring in the very eutrophic bays, and both nutrients were low in less-polluted outer areas during summer. Assays with Nodularia sp. showed that phosphorus was the growth-limiting factor for this nitrogen-fixing blue-green alga, especially in spring and early summer. The waste load discharged to the increasingly eutrophic area consists primarily of untreated municipal sewage from Helsinki and Espoo (about 450-500 tons phosphorus and 2400-2600 tons nitrogen/yr), and polluted water discharged by the Vantaa River (about 100 tons P and 1500 tons N/yr). Salinity variations of 3-6% in summer do not affect growth of Chlorella. Inner bays (over 100 mg C sub ass./cu m/day) and the inner archipelage (200-1000 mg) are eutrophic, and the outer archipelago is fairly clean (< 200 mg); each area was sampled. Samples were enriched with nitrogen, phosphorus, and trace amounts of boron, manganese, zinc, cobalt, copper, molybdenum, and iron in various combinations. (See also W79-03842) (Lynch-Wisconsin)
W79-03889

RELATIONSHIP BETWEEN ALGAL PHOSPHORUS EXTRACTION AND WATER PHOSPHORUS CONCENTRATION,
FMC Corp., Princeton, NJ. Research and Development Center.
For primary bibliographic entry see Field 5C.
W79-03890

SORPTION AND CONCENTRATION OF TAXIC MINERALS BY MASS CULTURES OF CHLOROCOCCALES,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Dortmund (Germany, F.R.).
For primary bibliographic entry see Field 5C.
W79-03892

COHO SALMON (ONCORHYNCHUS KISUTCH) AND HERRING GULLS (LARUS ARGENTATUS AS INDICATORS OF ORGANOCHLORINE CONTAMINATION IN LAKE ONTARIO,
Canadian Wildlife Service, Ottawa (Ontario). Wildlife Toxicology Div.
R. J. Norstrom, D. J. Hallett, and R. A. Sonstegard.
Journal of the Fisheries Research Board of Canada, Vol. 35, p. 1401-1409, 1978. 1 fig, 5 tab, 25 ref

Descriptors: *Bioindicators, *Chlorinated hydrocarbon pesticides, *Coho salmon, *Gulls, *Pesticide residues, Insecticides, Polychlorinated biphenyls, DDE, DDD, Dieldrin, Great Lakes, Lake Ontario, Smelts, *Mirex, *Tissue analysis, *Bioaccumulation, Pollutant identification, Alewives.

Coho salmon and herring gulls in the Great Lakes depend to a large extent on alewives and smelt for their food. All of these species range widely in the lakes, and therefore provide an integrated measure of levels of organochlorine contaminants in the lakes. Organochlorine residues were determined in herring gull eggs from four eastern Lake Ontario colonies, coho salmon from western Lake Ontario, and pooled alewife and smelt from the stomach contents of the salmon. The mean apparent bioconcentration factor was 2.9 + or - 0.7 for accumulation of PCBs, DDE, mirex, photomirex, HCB, dieldrin, and DDD. The bioconcentration factor was 50 + or - 10 for accumulation of PCBs with more than five chlorines, DDE, mirex, and photomirex in herring gull eggs. PCBs with fewer than six chlorines, HCB, dieldrin, and DDD were concentrated concentrated to a lesser extent in herring gull eggs. Assuming an apparent bioconcentration factor from water of 5 x 10(5) for accumulation of PCBs, DDE, mirex, and photomirex in smelt and alewives, the corresponding values in coho salmon and herring gull eggs were 1.5 x 10(6) and 2.5 x 10(7). (EIS-Deal)
W79-03895

LYSOSOMAL RESPONSES TO EXPERIMENTALLY INJECTED ANTHRACENE IN THE DIGESTIVE CELLS OF MYTILUS EDULIS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5C.
W79-03900

237PU EXPERIMENTS WITH THE PLAICE PLEURONECTES PLATESSA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W79-03901

PROCEEDINGS OF THE FIRST AND SECOND USA-USSR SYMPOSIA ON THE EFFECTS OF POLLUTANTS UPON AQUATIC ECOSYSTEMS-VOLUME I: DULUTH, MINNESOTA, USA SYMPOSIUM OCTOBER 21-23, 1975, VOLUME II: BOROK, JAROSLAVL OBLAST, USSR SYMPOSIUM JUNE 22-26, 1976.
Environmental Protection Agency, Grosse Ile, MI.
For primary bibliographic entry see Field 5C.
W79-03906

CHARACTERISTICS OF THE MOSCOW RIVER WATER QUALITY ACCORDING TO HYDROBIOLOGICAL INDICES,
V. A. Abakumov, and G. L. Margolina
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 32-35, 1978.

Descriptors: *Water quality, *Aquatic populations, Moscow River, USSR, Water quality control, Bacteria, Phytoplankton, Zooplankton, Benthic fauna, Microorganisms, Plant populations, Primary productivity, Tophic level, Water treatment, Waste treatment, Hydrobiology, W P effects, *Species diversity, *Hydrobiological indices, Biological indicators.

In order to obtain hydrobiological indices characterizing the water quality of the Moscow River, the qualitative and quantitative composition of bacterioplankton, phytoplankton, zooplankton, zoobenthos, and higher water plants were studied. The authors concluded that it was essential to apply a combination of water quality control methods according to hydrobiological indices which provide information not only on water pollution, but also on the state of aquatic organisms in water bodies. (See also W79-03906) (EIS-Deal)
W79-03909

ENDPOINTS IN BIOASSAY,
L. L. Smith, Jr.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 36-36, 1978. 3 fig, 3 tab, 8 ref.

Descriptors: *Bioassay, *Toxicity, *Analytical techniques, *Chemical properties, Methodology, Lethal limit, Biochemistry, Enzymes, Growth stages, Chemical analysis, Reproduction, Mortality, Fecundity, Fertility, Growth rates, Animal physiology, Animal metabolism, Fish physiology, Laboratory tests, *Toxicity testing.

The purpose of this discussion was to elaborate on means of defining meaningful endpoints and interpreting the resultant findings. It was recommended that (1) the most sensitive stage be used where possible as the basis for acute median tolerance limit tests; (2) temperature used for tests should approximate the natural conditions to which the fish will be subjected during critical periods in the outdoor environment; (3) median tolerance limit value should be based on the time at which an asymptote is reached in the decline of the toxicity curve; (4) where possible, reproductive behavior and success be used as the final criterion of the proper endpoint used to determine safe concentration of toxicants or effluents; and (5) uniform application factors not be used over a broad spectrum of species or toxicants without definitive chronic tests. (See also W79-03906) (EIS-Deal)
W79-03910

PHYSIOLOGICAL-BIOCHEMICAL ASPECTS OF WATER TOXICOLOGY,
Tsentralnyi Nauchno-Issledovatelskii Inst. Osetrovogo Khozyaistva, Astrakhan (USSR).
V. I. Lykyanenko.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ceosystems - Vol 1, Environmental Protection Agency Report EPA-600/3-78-076. p 47-54, 1978. 31 ref.

Descriptors: *Fish physiology, *Water quality standards, *Toxicity, *Chemical analysis, Fish diseases, Phenols, Organic compounds, Chemical properties, Water quality, Water chemistry, Water analysis, Effluents, Chemical wastes, Industrial wastes, Pesticide residues, Heavy metals, Public health, Bioassay, Biochemistry, *Tissue analysis.

During the early decaded of this century basic standards for maximum permissible concentrations of harmful substances discharged into water bodies were introduced in many countries. The dominant role in establishing these standards belonged to medical specialists. However, in more recent years it was learned that levels of many substances which fully satisfy the health specialists do not guarantee the purity of water bodies from a general biological or fishing industry point of view. The author traces the development of knowledge in the area of fish biochemistry and physiology and how these advances have influenced standards for water quality. (See also W79-03906) (EIS-Deal)
W79-03911

MONITORING THE CONDITION OF FLOWING WATERS BY BIOLOGICAL ORANISMS,
R. Patrick.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p. 68-81, 1978. 6 fig, 1 tab, 8 ref.

Descriptors: *Bioindicators, *Oysters, *Diatoms, *Monitoring, Biological communities, Diptera, Heavy metals, Cytological studies Chemical analysis, Water chemistry, Water quality, Sampling, Biomass, Eutrophication, *Tissue analysis, *Bioaccumulation.

It is evident that the monitoring of biological organisms can be very valuable in determining the effects of wastes. As contrasted with chemical and physical determinations of water quality, the organisms integrate over time all deleterious effects, whereas a chemical examination only determine the presence of the chemical for which analysis is made at the particular time. The biological studies often give an indication of a certain type of chemical or deleterious conditions being present. It is then necessary to determine exactly what chemical is causing the effect. Therefore, both types of studies become important, but the biological studies are the better continual monitoring studies if only one type of monitoring is to be made, because it integrates all changes which may occur. (See also W79-03906) (EIS-Deal)
W79-03913

DETERMINING THRESHOLD AND BIOLOGICALLY DANGEROUS CONCENTRATIONS OF BLUE-GREEN ALGAE IN WATER BODIES,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5C.
W79-03916

TOXIC ORGANIC RESIDUES IN FISH,
Michigan State Univ., East Lansing.
H. E. Johnson.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 115-120, 1978, 18 ref.

Descriptors: *Chemical wastes, *Industrial wastes, Organic compounds, Polychlorinated biphenyls, DDT, Toxicity, Fish physiology, Animal metabolism, Path of pollutants, Pesticide residues, Trophic level, Public health, Dieldrin, *Tissue analysis, *Bioaccumulation.

The development of sophisticated analytical techniques and intensified chemical monitoring efforts has shown that a wide variety of synthetic organic chemicals or their degradation products is present in the aquatic environment. One example is the detailed analysis of PCBs in fish from the Great Lakes. It is imperative that we develop a systematic approach for evaluaton of new materials and new technology. Important new efforts are being made to find correlations between chemical structure and biological activity. A chemical classification system based on physical properties, chemical structure, and biological activity would provide some indication of potential hazard. Simple model ecosystems and food-chain models offer additional promise for preliminary testing to identify harmful properties of chemicals. (See also W79-03906) (EIS-Deal)
W79-03917

REGISTRATION OF PESTICIDES: CONSIDERATIONS IN CONDUCTING AQUATIC TOXICITY TESTS,
R. A. Schoettger.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 166-180, 1978, 5 fig., 17 ref.

Descriptors: *Pesticides, *Pesticide toxicity, *Bioassay, Legislation, Regulation, Chemical properties, Chemical analysis, Fish food organisms, Toxicity, Absorption, Growth rates, Fish physiology, Lampreys, Pesticide kinetics, Water pollution effects, *Teratogens, *Toxaphene, *TFM, *Lampricides.

Requirements for registration, re-registration, and classification of pesticides for general of restricted use were published recently by the EPA. If the pesticide is intended for outdoor uses, data must generally be submitted that permit evaluation of hazards to non-target animals, including fish and wildlife. Depth of these evaluations depends on proposed patterns of use, environmental chemistry characteristics, and nature of the hazard to humans, domestic animals, and non-target animals. Data to support registeration can be obtained from acute and chronic or partial chronic toxicity studies, simulated field tests, or field monitoring and observation, as described in the extensive registration guidelines recently proposed by EPSA. Chronic testing techniques and apparatus, with controllable light and temperature, offer versatile systems for investigating effects of pesticides and other contaminants on fish according to daily and seasonal periodicity and simulated pesticide-use patterns. (See also W79-03906) (EIS-Deal)
W79-03922

TOXICITY TESTS IN THE REGULATION OF WASTE DISCHARGES IN THE UNITED STATES,
P. Doudoroff.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 1-7, 1978. 9 ref.

Descriptors: *Toxicity, *Mortality, Bioassay, Waste treatment, Waste disposal, *Monitoring, Standards, Regulation, California, Laboratory tests, Toxic wastes, Application factors, Toxicity emission rate, Methodology.

There is a trend in the United Statee to require the regular biological testing of waste waters to verify compliance with, or to detect violations of, some specific regulatory requirements limiting discharge of toxic wastes. The philosophies that are used to develop the regulations regarding the disposal of toxic wastes are examined. (See also W79-03906) (EIS-Katz)
W79-03926

TOXICOLOGICAL CONTROL OF POLLUTION OF FRESHWATERS,
Moscow State Univ. (USSR). Faculty of Biology.
N. S. Stroganov.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p 8-10, 1978.

Descriptors: *Toxicity, *Bioassay, *Methodology, Standards, Water pollution effects, Domestic wastes, Industrial wastes, Laboratory tests, Toxicity control, *Monitoring, Degree of toxicity, Waste dilution, Waste water(Pollution), Waste disposal, Fresh water.

To control the quality of waste discharges in order to maintain the suitability of water for aquatic organisms, the toxicity of the wastes should be measured. The toxicity of waste waters should be determined. The toxicity of these wastes and associated hazards to aquatic organisms should be determined. (See also W79-03906) (EIS-Katz)
W79-03927

TOXICITY OF EXPERIMENTAL FOREST INSECTICIDES TO FISH AND AQUATIC INVERTEBRATES,
R. A. Schoettger, and W. L. Mauck.
In: Proceedings of the First andSecond USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p 11-27, 1978. 5 tab, 19 ref.

Descriptors: *Bioassays, *Toxicity, *Methodology, Laboratory tests, Freshwater fish, Benthos, Brook trout, Atlantic salmon, Sumithion, Carbaryl, Dylox, Matacil, Dimilin, Orthene, Pesticides, Insecticides, Carbamate Pesticides, Organic phosphate insecticides, Acute toxicity.

Aerial Application of six potential DDT substitute forest insecticides, with the exception of the field formulation of Matacil, should not have a major toxic effect on brook trout and Atlantic salmon. Insecticides are Sumithion, carbaryl, Dylox, Matacil, Dimilin ad Orthene. These insecticides may kill aquatic invertebrates. (See also W79-03906) (EIS-Katz)

W79-03928

MICROBIOLOGICAL INDICES OF THE QUALITY OF WATER AND METHODS OF THEIR DETERMINATION,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
V. I. Romanenko.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 55-74, 1978. 5 fig., 4 tab., 28 ref.

Descriptors: *Microbiology, *Bacteria, Water quality, *Methodology, Laboratory tests, Laboratory equipment, Aquatic bacteria, Bioindicators, Number of bacteria, Oxygen demand, Oxygen requirements, Monitoring.

Microbiological indices in some cases are the best way to characterize the quality of water used for both drinking and industrial purposes. Microorganisms are excellent indicators which often exceed the sensitivity of chemical and physical methods. Methods of using microorganisms to determine water quality are demonstrated. (See also W79-03906) (EIS-Katz)
W79-03931

A RESEARCH SYSTEM FOR DEVELOPING FISHERIES STANDARDS FOR WATER QUALITY, CONSIDERING THE PECULIARITIES OF TRANSFERRING EXPERIMENTAL DATA TO NATURAL WATER BODIES,
For primary bibliographic entry see Field 5G
W79-03933

EXPERIMENTAL TESTING OF TOXICITY OF WATER MEDIA AND INCREASING OF THE SENSITIVITY OF BIOLOGICAL TESTS,
L. P. Braginski, V. D. Bersa, T. I. Birger, I. L. Burtnaya, and F. Ya. komarovski.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 102-112, 1978. 5 tab., 29 ref.

Descriptors: *Methodology, *Bioassay, *Toxicity, Mortality, Laboratory tests, Laboratory animals, Phytoplankton, Algae, Daphnia, Amphipoda, Fresh water fish, USSR, Mollsuca, Monitoring.

The toxicity bioassay tests used in the USSR to determine water quality are examined. Organisms used are algae, Daphnia, amphipods, molluscs, and several species of fresh water fish. (See also W79-03906) (EIS-Katz)
W79-03935

EXPERIMENTAL APPLICATION OF VARIOUS SYSTEMS OF BIOLOGICAL INDICATION OF WATER POLLUTION,
G. G. Winberg.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 141-149, 1978. 2 fig., 9 ref.

Descriptors: *Water pollution effects, *On-site-investigations, *Methodology, USSR, Benthos, Environmental effects, Aquatic populations, Aquatic productivity, Polluted waters, Oligochaetes, Biotic index, Diversity index, Indicator organisms, Aquatic insects, Zooplankton, *Bioindicators.

Studies are being made in the USSR on the evaluations of the various methods of biological analysis of water pollution. Comparative evaluation of the various systems of hydrobiological analysis of polluted waters has been made by the staff of the Laboratory of Freshwater and Experimental Hydrobiology of the Zoological Institute of the USSR Academy of Sciences. (See also W79-03906) (EIS-Katz)
W79-03939

STRUCTURAL AND FUNCTIONAL CHARACTERISTICS OF SESTON AS INDICES OF WATER POLLUTION,
A. P. Ostapenya
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol II, Environmental Protection Agency, EPA-600/3-78-076, p 150-157, 1978. 5 fig, 1 tab.

Descriptors: *Seston, *Methodology, *Plankton, Phytoplankton, *Water pollution effects, Chlorophyll, USSR, Oxygen demand, Photosynthesis, Primary production, Trophic level, On-site investigation, Index of pollution, Bioindicators, Dissolved oxygen, Aquatic ecosystems, Aquatic populations.

Plankton has long been a traditional part of ecological investigations related to water pollution Accumulated data show convincingly that seston, including planktonic, detrital and mineral suspensions are an important, distinct structural component of aquatic ecosystems, functioning as a single entity. Seston actively influences the quality of water. This influence is diverse, and is evident by its action on the production and destruction stages of the biotic circulation. Structural and functional characteristics of the seston are sufficiently sensitive for use as an indicator in the evaluation of water pollution. (See also W79-03906) (EIS-Katz)
W79-03940

VOLATILE LOSSES OF NITROGEN FROM SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources
For primary bibliographic entry see Field 3F.
W79-03947

X-RAY ANALYSIS OF AIRBORNE ASBESTOS, DESIGN AND CONSTRUCTION OF A PROTOTYPE ASBESTOS ANALYZER,
Naval Research Lab., Washington, DC. Radiation Technology Div
L. S. Birks, J. V. Gilfrich, and J. W. Sandelin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 512, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-78-194, August 1978. 23 p, 9 fig, 1 tab, 3 ref. Interagency Agreement EPA-IAG-D6-0651

Descriptors: *Asbestos, *Air pollution, *X-ray diffraction, *Spectroscopy, Analytical techniques, Instrumentation, Prototypes, Measurement, Clays, Mineralogy, Analysis, Prototype tests.

The design and construction of the working prototype asbestos analyzer is described. The analyzer incorporates the principal of broad-beam x-ray optics and a special fiber-alined sample. Two detectors are used for simultaneous measurement of diffracted signal and background. The prototype analyzer allows fibrous asbestos to be distinguished from nonfibrous forms or clay minerals of similar character, and relies on sample preparation where the asbestos fibers are oriented on a special grid. The x-ray optics allow specific 20 diffraction angles to be selected for large-area specimen deposits. Sub-microgram amounts of asbestos can be detected and quantitatively measured. The analyzer is contained in a 15 x 15 x 32 cm vacuum box and is mounted on top of a standard commercial x-ray supply. The Cr target spectrographic tube is located in a separate lead-shielded enclosure in the box. The beam trap, a critical component, reduces the backscattered noise signal to less than 100 photons/sec from an incident beam of 10 to the eleventh power photons/sec. (Davison-IPA)
W79-03967

EVALUATING THE SAMPLING FREQUENCIES OF WATER QUALITY MONITORING NETWORKS,
Colorado State Univ., Fort Collins. Dept. of Agriculture and Chemical Engineering.
For primary bibliographic entry see Field 5C.
W79-03976

RESULTS OF RESEARCH RELATED TO STRATOSPHERIC OZONE PROTECTION, REPORT TO CONGRESS,
SRI International, Menlo Park, CA.
R. E. Ruff, P. B. Russell, S. D. Kaplan, B. R. Holt, and J. W. Ryan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 400, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/8-78-002, January 1978. First biennial report to Congress required by Section 153(g), PL 95-95. 50 p, 6 fig, 5 tab, 23 ref. 68-01-3939.

Descriptors: *Ultraviolet radiation, Aquatic life, *Plant growth, *Skin cancer, *Clean Air Act, *Ozone-depletion, Human diseases, Crustaceans, Social impact, Economic impact, Spectroradiometry, *Air pollution effects

The results of research conducted under Section 153 of Public Law 95-95 by the Environmental Protection Agency (EPA), and the results of related research and studies conducted by other Federal agencies is reported. Research on ozone protection has been coordinated under a Biological and Climatic Effects Research (BACER) Program, a multiagency, multidisciplinary effort originally funded by EPA. Its purpose is to reduce uncertainties regarding ozone-depletion to quantify ozone-depletion impacts wherever possible. The effects resulting from the release of ozone-depleting substances have been shown to impact on biological system and climate, which in turn have social and economic impacts. Activities include surveys of skin cancer among populations at different latitudes, measurements of Ultraviolet B (UV-B) radiation, tests of over 100 plant species under simulated and natural UV-B levels, experiments with aquatic ecosystems, and social economic workshops. Study results indicate: skin cancer incidence is related to UV-B exposure; all plants are sensitive to UV-B at some exposure level, resulting in stunting bleached or discolored leaves; and UV-B damages the larvae of shrimp, crab, mackerel, and anchovy. New UV-B monitoring devices developed include the Norris spectroradiameter for biological effects research and a submersible spectroradiometer for aquatic use. Future long term and short term research needs are discussed. (Davison-IPA)
W79-03977

A RAPID METHOD FOR ESTIMATING LOG P FOR ORGANIC CHEMICALS,
Environmental Research Lab.-Duluth, MN
G. D. Veith, and R. T. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 386, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-049, May 1978. 24 p, 2 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identifiction, *Chemical analysis, *Chromatography, *Organic chemicals, Logarithms, Equations, Laboratory equipment, Mathematics, Ultraviolet detectors, Laboratory tests, Time, Economics.

A study, using a variety of industrial chemicals, was conducted to determine if Log P and the high pressure liquid chromatography (HPLC) reverse phase retention time are related, and to develop an inexpensive method requiring less than an hour for estimating Log P by using HPLC. The technique developed estimates the n-octanol/water partition of organic chemicals. The system consisted of preparative Micro-Pak (R) C-10 reverse phase column eluted isocratically with a 15% water/85% methanol solvent pumped through the column at 2.0 ml/min at 1,200 psi. The chemicals were first dissolved in a mixture of acetone and cyclohexane, then detected in the eluant with 254-nm ultraviolet detector, a fraction collector was used for chemicals that cannot be detected by the ultraviolet detector. The fractions were analyzed to determine the retention time of the chemical. The log of the retention time (LogRT) of organic chemicals on a permanently bonded reverse-phase HPLC system is linearly related to the log of the n-octanol water partition coefficient (Log P): P = 5.106 Log RT-

1.258 with a correlation coefficient 0.975. By using a calibration mixture, the Log P of other organic chemicals were estimated with a mean accuracy of 22.8%. This technique permits estimation of Log P in a maximum of 25 minutes, and does not require a knowledge of the chemical structure for the estimate. (Davison-IPA)
W79-03978

MANUAL FOR THE INTERIM CERTIFICATION OF LABORATORIES INVOLVED IN ANALYZING PUBLIC DRINKING WATER SUPPLIES -- CRITERIA AND PROCEDURES,
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 118, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA 600/8-78-008, May 1978. 100 p, 5 tab.

Descriptors: *Laboratory certification, *Water Quality Act, Potable water, *Inspection, Water quality, Water analysis, Radiochemical analysis, Microbiology, Quality control, Water quality standards, Publications.

Evaluation procedures and minimum technical requirements recommended for interim certification of laboratories analyzing public drinking water supplies are described; optional certification requirements have been included. The manner in which the Environmental Protection Agency (EPA) will carry out a program for interim approval and certification of its 10 regional laboratories and principal state laboratories is described. Formal certification of a laboratory under regulatory authority is the preferred approach of a certification program. However, a phased approach has been selected because the interim regulations are already in effect. Interim approval will be granted to laboratories on an administrative basis in phase one to provide acceptable data for immediate implementation of the Interim Primary Regulations. After an on-site evaluation based on the contents of this manual, Interim Certification will be granted. The emphasis of this phase is to provide advice and technical requirements and optional requirements for conducting on-site evaluations of chemical, microbiological and radlogical laboratories are set forth. (Davison-IPA)
W79-03979

SAMPLING AND ANALYSIS RESEARCH PROGRAM AT THE PARAHO SHALE OIL DEMONSTRATION,
TRW Environmental Engineering Div., Redondo Beach, CA.
J. E. Cotter, C. H. Prien, J. J. Schmidt-Collerus, D. J. Powell, and R. Sung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 027, Price codes: A03 in paper copy, A01 in microfiche. Final Report No EPA-600/7-78-065, April 1978. 80 p, 21 fig, 18 tab, 6 ref, 3 append. 68-02-1881.

Descriptors: *Pollutant identification, *Oil shales, *Liquid wastes, *Sampling, *Prototype tests, Chemical analyses, Chemical wastes, Laboratory tests, Analytical techniques, Chromatography, Mass spectrometry, Anvil Points, *Colorado.

A study of the eight oil shale retorting processes at the Paraho oil shale demonstration site at Anvil Points, Colorado, was undertaken to establish characteristics common to the processes to develop prototype sampling and analytical procedures for shale oil recovery operations. The Anvil Points operations includes two vertical retorts: a larger semi-works unit and a smaller pilot plant. The test plan included both retorts because their process streams are essentially different. Sample locations were determined by the need for information on process streams relative to emissions and effluents expected in a full scale plant. Samples taken included: the recycle gases, hydrogen sulfide, sulfur dioxide, oxides of nitrogen, ammonia and arsine; recycle condensate; process water; processed shale discharged from the retorts; and dust from the vicinity of the crushing and screening equipment. The various laboratory analyses included: wet chemical analysis, spark source mass spectrometry, high pressure liquid chromatography, thin layer chromatography, gel permeation chromatography, and gas chromatography/mass spectrometry (GC/MS). Condensate water inorganic analyses were done for calcium, magnesium, sodium and potassium salts, ammonia, gross parameters, and trace elements. Condensate and water samples were analyzed for organic neutrals, organic acids, and organic bases. Data obtained from the crushing and retorting operations are unique to the Paraho demonstration because much of the equipment and many of the operating procedures are not employed in a commercial venture. (Davison-IPA)
W79-03980

THE MULTIELEMENTAL ANALYSIS OF DRINKING WATER USING PROTON-INDUCED X-RAY EMISSION (PIXE),
Purdue Research Foundation, Lafayette, IN.
P. C. Simms, and F. A. Rickey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 832, Price codes: A04 in paper copy, A01 in microfiche. Final Report No EPA-600/1-78-058, September 1978. 58 p, 7 fig, 9 tab, 6 ref. 68-03-2178.

Descriptors: Pollutant identification, *Water analysis, *Chemical analysis, *Potable water, *Nuclear acceleration, *Water properties, X-ray analysis, Data processing, X-ray fluorescence, Vapor separation techniques, Filtration, Trace elements, Laboratory tests, Proton-induced x-ray emission, Spectroscopy, Water supply, Atomic absorption.

The use of energetic protons from a nuclear accelerator to perform quantitative, multi elemental analysis of drinking water is described. Before Proton Induced X-ray Emission (PIXE) could be used for aqueous samples, 'vapor filtration', a new method for depositing the elements on a backing suitable for proton bombardment, was developed. When a sample is bombarded with protons, characteristic x-rays emitted from each element can be used in identifying the element in the sample. The x-rays are detected by an energy sensitive semiconductor device, and the data are processed by an on line computer. A total of 76 elements heavier than aluminum were identified from 6200 samples. Atomic absorption was used for sodium analysis. Excellent detection limits (0.1 to 100 ppb) were obtained for most elements heavier than silicon. Cost per sample in this project was $42.60, but with improvements to this particular accelerator, quality analyses for 20,000 samples per year could be provided at an approximate cost reduction of 50% per sample. (Davison-IPA)
W79-03981

ARSENIC DETERMINATION BY THE SILVER DIETHYLDITHIOCARBAMATE METHOD AND THE ELIMINATION OF METAL ION INTERFERENCE,
Claflin Coll., Orangeburg, SC.
S. S. Sandhu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 153, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/4-78-038, July 1978. 36 p, 7 fig, 5 tab, 22 ref. R 804164-01.

Descriptors: *Pollutant identification, *Water analysis, *Laboratory tests, *Chemical interference, *Arsenic, *Ions, Color reactions, Chemical analysis, Potable water, Waste water, Organic compounds, Trace metals, Inorganic compounds, Anion exchange, Water quality, Water chemistry, Distillation.

Data resolving the confusion surrounding the extent of ion interference in the determination of arsenic in water and waste water using the silver diethyldithiocarbamate (SDDC) method is presented. The standard procedure, with minor variations, was used for this study. Micro amounts of arsenic were recovered in the presence of the interferring ions, chromium (IV), cobalt (II), copper (II), molybdenum (VI), and nickel (II). The metal ions did not appear to interfere in the generation of arsine for concentrations of 5.0 mgL-1 and under. A significant positive interference in arsenic-SDDC color development and measurements was shown by antimony (III) concentrations of 0.3 mgL-1 or above, and mercury (II) concentrations of 1.5 mgL-1 or above. Organically bonded arsenic was successfully released by the potassium permanganate digestion method before its determination by SDDC. It was found that the distillation method was unsatisfactory for concentrating and isolating arsenic from interfering ions in synthetic dilute aqueous solutions and natural water before determination by SDDC. The anion exchange method was effective for eliminating the interferring ions, but arsenic recovery decreased in the presence of high concentrations of antimony in polluted water. However, recovery was improved by an increase in the amount of resin used in the chromatographic column. (Davison-IPA)
W79-03982

A CASE STUDY OF HAZARDOUS WASTES IN CLASS I LANDFILLS,
Southern California Univ., Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5B.
W79-03984

PROCEEDINGS OF THE SECOND WORKSHOP ON SAMPLING GEOTHERMAL EFFLUENTS.
Report No. EPA-600/7-78-121, June 1978. Workshop held in Las Vegas, Nevada, February 15-17, 1977. 256 p, 79 fig, 22 tab, 98 ref. 68-03-2468.

Descriptors: *Geothermal studies, *Analytical techniques, *Effluents, *Sampling, *Geochemistry, Pollutants, Monitoring, Standards, Water analysis, Soil analysis, Methodology, *Conferences, Publications, Abstracts, Information exchange.

A compilation of 17 papers, and abstracts of 14 others, presented at the second in a series of workshops on sampling and analysis of geothermal effluents is provided. The purpose of the workshop was to continue the exchange of ideas and knowledge introduced at the first workshop held in October 1975. It is intended that an acceptable set of standard geothermal effluent and analysis methods will eventually be developed from this series of workshops. Papers presented cover techniques and devices for sampling and measuring gases, soils, and water associated with geothermal areas, interpretation of results of sampling, and data from various specific areas. (Davison-IPA)
W79-03987

INORGANIC SPECIES IN WATER: ECOLOGICAL SIGNIFICANCE AND ANALYTICAL NEEDS, A LITERATURE REVIEW,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5C.
W79-03992

MERCURY, LEAD, ARSENIC, AND CADMIUM IN BIOLOGICAL TISSUE. THE NEED FOR ADEQUATE STANDARD REFERENCE MATERIALS,
Environmental Monitoring and Support Lab., Las Vegas, NV.
W. F. Beckert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 198, Price codes: A04 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency, EPA-600/4-78-051, 68 p, August 1978. 2 fig, 12 tab, 1 app, 221 ref.

Descriptors: *Mercury, *Lead, *Cadmium, *Arsenic compounds, Toxicity, Mortality, Analytical techniques, Chemical analysis, Path of pollutants, Heavy metals, Plant physiology, Animal physiology, Fish physiology, *Arsenic, *Bioaccumulation, *Tissue analysis, *Carcinogens, *Mutagens, Reference standards.

The present situation of standard reference materials consisting of plant and animal tissues is exam-

ined. A brief literature review presents a cross-section of published data on the incorporation of mercury, lead, arsenic, and cadmium into plant and animal tissues. It points out the wide concentration ranges of these elements that are encountered in biological tissue samples under environmental and experimental conditions. These concentration ranges are compared with the individual values of the corresponding elements as determined for the biological standard reference materials presently available from the National Bureau of Standards. The conclusion is reached that there is a need for the preparation of additional biological reference materials encompassing wide concentration ranges of the elements of interest. (EIS-Deal)
W79-03995

THE SELENASTRUM CAPRICORNUTUM PRINTZ ALGAL ASSAY BOTTLE TEST EXPERIMENTAL DESIGN, APPLICATION, AND DATA INTERPRETATION PROTOCOL,
Corvallis Environmental Research Lab., OR.
W. E. Miller, J. C. Greene, and T. Shiroyama.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 950, Price codes: A07 in paper copy, A01 in microfiche. Report EPA 600/9-78-018, July 1978, 126 p, 21 fig, 12 tab, 184 ref.

Descriptors: *Algae, *Nutrients, *Methodology, *Laboratory tests, Metals, Toxicity, *Eutrophication, Laboratory equipment, Nitrogens, Phosphorus, Algal control, Experimental design, Nutrient limitation, Heavy metal toxicity, *Selenastrum, Algal assay forms.

This document is the product of intensive research to improve and expand the understanding of results obtained from the Algal Assay Procedure: Bottle Test (USEPA 1971) to enable investigators to define the stimulatory and/or inhibitory interactions of municipal, industrial and agricultural wastes upon algal productivity in natural waters. This research was designed to determine the impact of nutrients and/or changes in their loading upon algal productivity; whether the growth response of Selenastrum capricornutum reflects the response of indigenous species; the feasibility of the assay test protocol to evaluate heavy metals; the capability of the assay to define the effect(s) of complex wastes; and if the assay information can be applied to define and assist in the management of real-world situation. As a result of these research efforts the Selenastrum capricornutum Printz Algal Assay Bottle Test: Experimental Design, Application and Data Interpretation Guide is offered now for wider application in both eutrophication and toxicity problem areas. (EIS-Katz)
W79-03996

5B. Sources Of Pollution

ULTRASTRUCTURAL ALTERATIONS IN THE EGGSHELL GLAND EPITHELIUM OF THE MALLARD DUCK AFTER CHRONIC EXPOSURE TO DDT,
Edgewood Arsenal, Aberdeen Proving Ground, MD. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W79-03506

LOWER SANTEE RIVER ENVIRONMENTAL QUALITY STUDY; AN ASSESSMENT OF SELECTED BIOLOGICAL AND PHYSICAL PARAMETERS.
South Carolina Water Resources Commission, Columbia.
Report No 122, Estuarine Studies, February 1976. 60 p, 9 fig, 4 tab, 7 ref, 1 append. Nelson, F.P. (editor)

Descriptors: *Santee River(SC), *Baseline studies, *Water quality, *Basic data collections, Mammals, *Aquatic plants, South Carolina, Rivers, Diversion, Dissolved oxygen, Biochemical oxygen demand, Nitrogen, Estuaries, Macrophytes, Floral lists, Faunal lists, Hydrology, Water chemistry, Phytoplankton, Algae, Crawl Creek(SC), Small animals(Mammals).

The Lower Santee River Environmental Quality Study (South Carolina) was originally intended as a hydrobiological baseline for evaluation of future changes (in particular a proposed river flow diversion), but several projected study inputs were not completed. This report includes: (1) a summary of findings and conclusions, (2) a report on water quality (1974-75), (3) a vascular plant survey (1974), and (4) a small mammal survey (1974-75). Tabular data include plant and animal species lists, measurements, and abundance, and 15 water quality parameters: water temperature, DO, BOD5, pH, specific conductance, color, turbidity, ammonia, nitrate, nitrite, Kjeldahl nitrogen, phosphorus, fecal coliforms, pesticide residues, and silicon dioxide. Data generally show lower water quality at Crawl Creek, but the pollutant is rapidly diluted or assimilated below the creek's confluence with the Santee. Only the Crawl Creek station had oxygen sag, which with BOD and other parameters indicated waste loading to the creek. Turbidity was low at all upstream stations, but doubled below Wambaw Creek due to suspended materials from the creek plus seawater influence. The Lower Santee is notable for faunal richness and scenic beauty. (Lynch-Wisconsin)
W79-03513

CONTINUOUS SIMULATION OF NONPOINT POLLUTION,
Ramlit Associates, Berkeley, CA
Y. J. Litwin, and A. S. Donigian, Jr.
Journal of the Water Pollution Control Federation, Vol. 50, No. 10, October 1978, p. 2348-2361. 9 fig, 26 ref.

Descriptors: *Nonpoint pollution, *Simulation analysis, *Water pollution sources, *Computer models, *Nonpoint source model, *Urban runoff, *Planning, *Land use, Model studies, Pollutants, Algorithms, North Carolina, Wisconsin, Washington, Third Fork Creek Basin(NC), Manitou Way Storm Drain Watershed(Madison WI), Benaroya Industrial Park Drainage Basin(South Seattle WA), Sedimentation, Runoff, Storm drains, Streams, Watersheds(Basins), Continuous simulation.

Test application of the Nonpoint Source Pollutant Loading Model (NPS) to three urban watersheds demonstrate that continuous simulation of sediment accumulation, generation, and transport by overland flow provides a viable means of assessing land surface contributions of nonpoint pollutants. The model in a single operation can stimulate nonpoint source pollution from five different land use categories. In addition to runoff, water temperature, DO, and sediment, the model simulates up to five user-specified pollutants. Model outputs can provide long-term continuous information on nonpoint pollution that can be used to establish the probability and frequency of occurrence of pollutant loadings under various land use configurations as a basis for evaluating the water quality impact of land use and policy decisions. Main limitations stem from simplification of the processes controlling nonpoint pollution, and the need to calibrate certain model parameters when applying the model to a watershed. When calibrated, the model can be used effectively to evaluate the impact of land use changes, regulations, and proposed plans. The NPS model was tested on the 433-ha Third Fork Creek Basin in Durham, North Carolina, the 60-ha Manitou Way Storm Drain Watershed in Madison, Wisconsin, and the 11.1-ha Benaroya Industrial Park Drainage Basin in South Seattle, Washington. (Lynch-Wisconsin)
W79-03515

MONTHLY OXYGEN AND CARBON BUDGETS OF THE NEW YORK BIGHT APEX,
Lamont-Doherty Geological Observatory, Palisades, NY
C. Garside, and T. C. Malone
Estuarine and Coastal Marine Science, Vol. 6, No. 1, January 1978, p. 93-104, 3 fig, 3 tab, 24 ref. NOAA 03-4-043-310, 04-6-022-44022

Descriptors: Environmental effects, *Energy budget, *Oxygen, *Carbon, Salinity, Temperature, Seasonal, Respiration, Primary production, Benthos, Water pollution sources.

This paper uses the distribution of primary production, salinity, temperature, dissolved oxygen and particulate organic carbon (POC) to establish monthly oxygen balances for the Apex of the New York Bight. The major source of POC was in situ primary production which was accompanied by high evasive surface oxygen flux and generally by higher levels of water column respiration. A major factor controlling benthic respiration was temperature. A lesser factor was resuspension of substrate material as a result of high runoff. It was concluded that major organic loading events resulting from this river runoff could result in small anoxic regions near the estuary. (Chilton-ORNL)
W79-03555

WORKSHOP ON COPPER IN ESTUARINE, CONTINENTAL AND MARINE WATERS.
Department of Energy, Washington, DC. Div of Biomedical and Environmental Research.
For primary bibliographic entry see Field 5C.
W79-03564

AN EXPERIMENTAL ASSESSMENT OF HALOGENATED ORGANICS IN WATERS FROM COOLING TOWERS AND ONCE-THROUGH SYSTEMS,
Oak Ridge National Lab., TN
R. L. Jolley, W. W. Pitt, Jr., F. G. Taylor, Jr., S. J. Hartmann, and G. Jones, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-771070-2, Price codes: A02 in paper copy, A01 in microfiche. CONF-771070, Gatlinburg, Tennessee, October 31-November 4, 1977. 13 p, 3 fig, 4 tab, 14 ref.

Descriptors: *Water pollution sources, *Air pollution, *Cooling water, *Cooling towers, Powerplants, Reactors, Chlorination, Organic compounds, Tennessee, Oak Ridge, Kingston Steam Plant.

In this assessment three cooling systems were studied: the cooling tower systems at Oak Ridge Gaseous Diffusion Plant the High Flux Isotope Reactor at Oak Ridge, and the once-through cooling system of the Kingston Steam Plant in Tennessee. Analysis of chlorinated water samples from these sources revealed the presence of numerous nonvolatile uv-absorbing and cerate-oxidizable constituents and it was suggested that these are probably chloro-organics. Chloroform, bromodichloromethane, dibromochloromethane, and bromoform are formed during the chlorination of cooling waters in both closed-cycle and once-through systems. The major portion of the chloroform, bromomethanes and bromoform are rapidly lost to the atmosphere. Data showed that the amount of chloroform lost from the ORGDP and the HFIR totaled more than a ton annually. (Chilton-ORNL)
W79-03565

EVALUATION OF VINYL CHLORIDE EMISSIONS IN THE LONG BEACH AREA, CALIFORNIA,
National Field Investigations Center-Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 642, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-330/2-74-002, May 1974. 44 p, 11 fig, 4 tab, 3 append.

Descriptors: *Pollutant identification, *Vinyl chloride, *Water pollution, *Air pollution, *Industrial wastes, Effluents, Water pollution sources, Hazards, Waste treatment, Sampling, Sludge, American Chemical Corporation, B.F. Goodrich Chemical Company, Long Beach, California, Surveys, Toxicity, Public health.

A survey of vinyl chloride emissions was conducted at the American Chemical Corporation and

B.F. Goodrich Chemical Company in Long Beach, California. It was found that vinyl chloride monomer (VCM) was being emitted from the plants via water, sludge, and air. An estimated five lbs/day leave the B.F. Goodrich plant and 22 lbs/day leave the American Chemical plant in the waste water effluents. Evaluations for both plants are presented, major waste water sources are identified, and plant waste water treatment systems are described. The sampling program consisted of waste water samples taken from three sampling stations at B.F. Goodrich and seven stations at American Chemical; grab samples of ambient air were taken from 15 locations surrounding the plant and analyzed with the Wilks Scientific MIRAN Portable Gas Analyzer. On site release of VCM to the air during venting, cleaning or by accident, was monitored by infrared spectrometer. Indications are that these plants will be routinely in violation of the standard proposed by the Occupational Safety and Health Administration for employee exposure level. (Davison-IPA)
W79-03577

PARAQUAT SORPTION AS A FUNCTION OF PARTICLE SIZE IN NATURAL SEDIMENTS,
Environmental Research Lab., Athens, GA.
S. W. Karickhoff, and D. S. Brown.
Journal of Environmental Quality, Vol. 7, No. 2, p 246-252, April-June, 1978. 1 fig, 6 tab, 13 ref, 9 equ.

Descriptors: *Paraquat, *Sorption, Adsorption, Particle size, Pesticides, Pollutants, *Sediments, Isotherms, Cation exchange, *Clay mineral.

The distribution of sorbed paraquat as a function of particle size (sand through clay) was determined on five natural sediments. Paraquat concentrations in individual size fractions varied as much as two orders of magnitude within a given sediment, showing a pronounced preference for the fine silt and clay fractions. Adsorption isotherms were measured for individual size separates on one sediment. Paraquat distributions in the whole sediment agreed well with those computed using the isotherm coefficients determined on individual size separates. Paraquat sorbs by ion exchange, and sorption partition coefficients showed a definite correlation with the cation exchange capacity (CEC) of individual size fractions. However, exchange sites in different fractions differed in their effectiveness in sorbing paraquat, with the fine silt and clay exchange sites being more effective than those of the larger separates. In pure clay suspensions (hectorite and montmorillonite), sorbed paraquat did not distribute uniformly throughout the clay particle size range. It was concluded that for highly sorbed compounds such as paraquat, conventional phase separation techniques for measuring sorption may not distinguish sorbed vs. 'free' compounds. (Skogerboe-Colorado State)
W79-03595

UTILIZATION OF THE STEAM DISTILLATION PROCEDURE FOR THE DETERMINATION OF METHYL MERCURY IN FISH AND SHELLS BY GAS-LIQUID CHROMATOGRAPHY, (IN JAPANESE),
Yamaguchi Prefectural Research Inst. of Health, (Japan).
For primary bibliographic entry see Field 5A.
W79-03635

DYNAMIC MODEL OF NUTRIFICATION IN HUNTINGTON BAY, NEW YORK,
Long Island Univ., Greenvale, NY. Dept. of Marine and Environmental Science.
D. J. Yezzi, Jr, and A. P. Uzzo, Jr.
Ecological Modelling, Vol. 6, p 59-75, 1979. 3 fig, 4 tab, 23 ref.

Descriptors: *Model studies, *Nutrients, Bays, Phytoplankton, Zooplankton, Nitrogen, Phosphorus, Mathematical models, Ammonia, Nitrates, Chemical analysis, Municipal wastes, Sediment transport, Trophic levels, Predation, Growth rates, Productivity, Ecosystems, Estuaries, *Huntington Bay(NY), *New York, Long Island Sound.

A dynamic simulation model of nutrification with respect to phytoplankton and zooplankton levels in Huntington Bay is developed. The validity of relationships used by previous researchers in freshwater environments is tested under marine conditions. Nutrients are modelled, and it is shown that nitrogen is the limiting nutrient in the bay. Phosphorus is not found to be limiting. (EIS-Deal)
W79-03638

POLLUTION PROFILE OF A RIVER,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
A. D. Paul, and K. C. Pillai.
Water, Air and Soil Pollution, Vol. 10, p. 133-146, 1978. 6 fig, 7 tab, 9 ref.

Descriptors: *Radioisotopes, *Thallium radioisotopes, Uranium radioisotopes, Rivers, River flow, Industrial wastes, Chemical wastes, Water quality, Water chemistry, Sediment transport, Chemical analysis, Acids, Salts, Metals, Path of pollutants, Suspended solids, Deposition(Sediments), Sedimentation, Water Pollution sources, *Periyar River(So India), *India.

A host of chemical industries subject the Periyar River (India) to pollutants such as acids, alkalies and their salts, trace metals and radionuclides belonging to the Th and U chains. Proximity of different outfalls and poor lateral mixing in the river are responsible for high local aquatic concentrations. Scavenging reactions, in situ, and sedimentation of suspended matter result in the accumulation of radionuclides near the outfall area. The monsoon 'flushes out' the river into the backwater area. Translocation of sediments is the major factor in the transport of pollutants. (EIS-Deal)
W79-03641

MERCURY BIOCONCENTRATION IN FISH: TEMPERATURE AND CONCENTRATION EFFECTS,
Northwestern Univ., Evanston, IL. Dept. of Environmental Health Engineering.
H. Cember, E. H. Curtis, and B. G. Blaylock.
Environmental Pollution, Vol. 17, p. 311-319, 1978. 4 fig., 3 tab., 4 ref.

Descriptors: *Mercury, *Sunfishes, Chemical analysis, Path of pollutants, Heavy metals, Water chemistry, Water analysis, Industrial wastes, Chemical wastes, Mortality, Fish physiology, Animal metabolism, Absorption, Food chains, Public health, *Bioconcentration, *Bioaccumulation, *Tissue analysis.

Mercury bioconcentration factors in bluegill sunfish (Lepomis macrochirus) were investigated over a period of 688 h by exposing the fish to Ch3-Hg-Cl at water temperature of 9 degrees C 21 degrees C and 33 degrees C and Hg concentrations of 0.0002, 0.0005, 0.005 and 0.05 ppm. The bioconcentration factor was found to increase exponentially with water temperature at a rate of 0.066 per degree C. Mercury concentration in the water did not influence the bioconcentration factor. (EIS-Deal)
W79-03643

ACCUMULATION OF THE ORGANOPHOSPHATE BLACKFLY LARVICIDE ABATE (TEMEPHOS) IN SAROTHERODON MOSSAMBICUS, WITH REFERENCE TO THE LARVICIDAL CONTROL OF SIMULIUM DAMNOSUM,
Centre for Overseas Pest Research, London (England).
For primary bibliographic entry see Field 5C.
W79-03647

237PU EXPERIMENTS WITH THE THORNBACK RAY RAJA CLAVATA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W79-03649

REGULATION OF COPPER AVAILABILITY TO PHYTOPLANKTON BY MACROMOLECULES IN LAKE WATER,
Eidgenoessische Anstalt fuer Wasserversorgung, Abqasserreinilgung und Gewaesserschutz, Zurich (Switzerland).
R. Gachter, J. S. Davis, and A. Mares.
Environmental Science and Technology, Vol. 12, No. 13, p 1416-1421, 1978. 7 fig, 2 tab, 27 ref.

Descriptors: *Coppe, *Phytoplankton, *Filtration, Lakes, Filters, Membranes, Photosynthesis, Physiology, Metabolism, Bioassay, Chemical analysis, Water chemistry, Water analysis, Toxicity, Metals, Path of pollutants, Copper compounds, *EDTA, *Ligands.

Approximately two-thirds of the copper in lake water remains in the nonfilterable residue of the following two-step procedure: 0.45 Micro m filtration followed by Diaflo UM-2 membrane (passing mol wt 1000) ultrafiltration. Examination of the effect of this residual copper on the photosynthesis rate of natural phytoplankton has shown that this residual copper is physiologically not available to the organisms. This fact can be utilized in a bioassay (as demonstrated with EDTA as a test substance) to gain information on the concentration of a ligand and its apparent association constant with copper. It is concluded that nonultrafilterable ligands present in lake water form copper complexes as stable as the CuEDTA complex and can thus play an ecologically significant role in the regulation of copper availability and therefore its toxicity to phytoplankton. (EIS-Deal)
W79-03651

THE EFFECTS OF COAL ASH BASIN EFFLUENT AND THERMAL LOADING ON BACTERIAL POPULATIONS OF FLOWING STREAMS,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 5C.
W79-03659

FACTORS AFFECTING ATRAZINE ADSORPTION, DEGRADATION AND MOBILITY IN SOIL,
Nebraska Univ., Lincoln. Dept. of Agronomy.
T. H. Dao.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 575, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, May 1977. 68 p, 11 fig, 11 tab, 29 ref. OWRT B-030-NEB(5). 14-34-0001-5087.

Descriptors: *Herbicides, *Adsorption, Leaching, Water quality, *Atrazine, *Leaching, *Degradation(Decomposition), *Path of pollutants, Soils.

Experiments were conducted to study the process of adsorption, degradation and leaching of atrazine and the interrelationship of these processes in soil. Adsorption isotherms for atrazine were described by the Freundlich equation. Decrease in water:soil ratio, from 5:1 to 0.4:1 and in soil moisture content, from 0.1 to 0.3 bar moisture content led to an increase in adsorption of atrazine on soil. Increasing the concentration of electrolyte added to soil increased atrazine adsorption by reducing the solubility of the herbicide in solution. Increasing soil temperature from 5C to 30C increased atrazine adsorption on soil. This endothermic reaction was observed both before and after correction for differential atrazine solubility due to temperature. Thermodynamic quantities associated with the adsorption reaction were calculated to characterize the adsorption of atrazine on soil. Simultaneous degradation and fixation occurred during the leaching of atrazine through soil with 30 cm of water. Decreasing the water flow rates from 2 cm/hr to 1 cm/day greatly reduced the mobility of atrazine in saturated soil columns. The contribution of the diffusion process to the overall movement of atrazine in soil was estimated to be small. The diffusion coefficients of atrazine in saturated soils were in the order of 0.2 to 1.1 x 10-7 cm2/sec.
W79-03670

ADSORPTION AND DESORPTION IN MINE DRAINAGES,
Colorado School of Mines, Golden.
L. J. Holcombe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 614, Price codes: A06 in paper copy, A01 in microfiche MS Thesis (1977). 98 p. OWRT A-034-COLO(2) 14-34-0001-7012.

Descriptors: *Adsorption, *Desorption, *Sediment deposition, *Mineralization, Water quality, *Mine drainage, *Colorado mineral belt, Model studies, *Heavy metals, Water chemistry, Ion exchange.

In this report is analyzed the solid sediment deposited in a mine drainage and its effect on the solution chemistry; specifically, the adsorption of heavy metals by the hydrous oxides of manganese and iron. Forty-two sediment samples were collected from mine drainages in the Front Range and sieved to minus eighty mesh. A selective chemical attack on the sediments with a hydroxylamine hydrochloride and acetic acid mixture showed that manganese oxides controlled the amount of Co, Cu, Cd, Zn and Ni in the sediment. Hydrous oxides of iron, did not adsorb metals from solution and had a negative correlation with Mg, Al, Ca, Na, K, Cu, Pb, Ni, Mn, Zn, Co, and Cd. The sorption behaviors of manganese and iron hydrous oxides are strongly controlled by pH. At the low pH's of the mine drainages, iron oxides have a positive surface charge, thus preventing the adsorption of cations; manganese oxides have a negative surface charge at these pH's. Through the extraction method it was found that a large portion of the mine drainage sediments are adsorbed or precipitated material, the exact percentage being dependent on pH, Eh, complexing agents, stream flow, sediment distribution co-efficients and other factors. A model was designed and tested which will enable an experimentor to determine the distribution or isotherm for a metal between its aqueous form and as asorbed species. The isotherm method involves equilibration of a metal in solution with complexing agents and ion-exchangers, with subsequent determination of all forms of the metal. The ion-exchange method was used to determine the free metal and complexed metal concentrations in solution. Under ideal laboratory conditions, using synthetic exchangers and controlled solution parameters, the isotherm method was accurate in determining the 'true' isotherm for Zn(II) when citrate was present as a complexer.
W79-03673

THE EFFECT OF HIGH 2, 4-D CONCENTRATIONS ON DEGRADATION AND CARBON DIOXIDE EVOLUTION IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science; and Florida Univ., Gainesville. Dept. of Food Science and Human Nutrition.
L-T. Ou, D. F. Rothwell, W. B. Wheeler, and J. M. Davidson.
Journal of Environmental Quality, Vol. 7, No. 2, p. 241-246, April-June, 1978. 6 fig, 6 tab, 13 ref.

Descriptors: Pesticides, *Herbicides, *Pesticide residues, Persistence, *Microbial degradation, Pesticide toxicity, Carbon dioxide, Waste disposal, *2,4-D.

A laboratory experiment was conducted to determine the degradation of high concentrations of 2,4-D (2,4-dichlorophenoxyacetic acid) and CO2 evolution in three soils. Two forms of 2,4-D, technical grade and formulated, were added to each soil at rates of 50, 500, 5,000 and 20,000 micrograms/g of soil (ppm). Degradation of the 2,4-D was measured by 14CO2 evolution resulting from the oxidation of uniformly ring-labeled carbon. At an application rate of 500 ppm, all three soils degraded 2,4-D. At 5,000 and 20,000 ppm, degradation occurred in the Webster silty clay loam and Terra Ceia organic soil, but not in the Cecil sandy loam during 80 days of incubation. The degradation rate was generally higher for the formulated 2,4-D than the technical grade material. For the higher 2,4-D concentrations, 5,000 or 20,000 ppm, when extensive degradation occurred, total CO2 evolution was also greatly stimulated, and the pattern of total CO2 evolution rate exhibited a two-peak response. Carbon dioxide-carbon (CO2-C) from the first peak appeared to be mainly from the formulation materials or from the impurities and CO2-C from the second peak was mainly from 2,4-D-C. (Skogerboe-Colorado State)
W79-03678

EFFECT OF SOIL MOISTURE CONTENT UPON ADSORPTION AND MOVEMENT OF PHOSPHORUS FROM LEACHATES OF DOMESTIC WASTE DISPOSAL SYSTEMS,
Maine Univ. at Orono.
T. G. McNeice
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 561, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, August 1978. 74 p, 21 fig, 3 tab, 54 ref. OWRT A-044-ME(1)

Descriptors: Porous media, Hydraulic properties, Soils, Septic tanks, *Adsorption, *Soil moisture, *Phosphorus, Organic matter, Saturation, Penetration, *Moisture content, Waste water disposal fields, *Leachates, Path of pollutants, Adams soil, Soil columns, Phosphorus adsorption.

Physical principles of porous media flow were used to establish functional relationships between hydraulic properties of an Adams soil. Soil columns simulating septic tank adsorption fields were used in conjunction with the hydraulic property data to investigate effect of soil moisture content upon the adsorption and movement of phosphorus. Experimental tests were employed to determine other factors such as pH and organic matter content specific to the Adams soil, which could effect phosphorus retention. It was demonstrated that the effect of reducing the level of saturation in a soil is to greatly increase the amount of phosphorus adsorbed and thereby limit the depth of penetration.
W79-03683

MEASUREMENT OF THE ENGINEERING PROPERTIES OF MUNICIPAL INCINERATOR RESIDUES AND CONSIDERATION OF LEACHATE CHARACTERISTICS,
Connecticut Univ., Storrs
G. G. Jillson
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 675, Price codes: A05 in paper copy, A01 in microfiche. MAster of Science Thesis, 1976. 92 p, 29 fig, 14 tab, 2 append, 14 ref. OWRT A-67-CONN(3), 14-31-0001-6007.

Descriptors: *Incineration, *Sewage sludge, *Leachate, *Waste disposal, *Landfills, *Municipal wastes, *Incinerator residue, *Solid wastes, Hydraulic properties, Mechanical properties, Batch feed solid waste incinerator, Continuous feed sewage sludge incinerator.

The hydraulic and mechanical properties of incinerated municipal solid waste and incinerated sewage sludge were measured. The specific tests carried out were: Standard Proctor density, saturated permeability, triaxial strength and one-dimensional strength tests. These tests were performed on samples from a batch feed solid waste incinerator, a continuous feed solid waste incinerator and a continuous feed sewage sludge incinerator. The results indicated that all three types of incinerator ash are a stable, lightweight fill material that when compacted could be used as landfill cover in recreational areas or any other use that does not require high strength or stiffness. The permeability of the compacted ash is high enough to allow infiltration of 90% of the rain that falls on it if the water table is below the surface. If the leaching of chemicals is to be prevented, the ash must be kept dry by an impervious cover or be placed in a pit lined with an impervious material.
W79-03685

METHODOLOGIES OF EXAMINING POLLUTION FROM URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, NJ Dept. of Civil and Environmental Engineering
J. M. DiLouie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 595, Price codes: A07 in paper copy, A01 in microfiche M.S. Thesis, October 1978, 120 p. 50 fig, 18 tab. OWRT A-046-NJ(3), B-059-NJ(2), B-063-NJ(2), 14-34-0001-5128, 7124.

Descriptors: *Urban runoff, *Storm runoff, *Rainfall intensity, *Antecedent precipitation, *Pennsylvania, *New Jersey, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Phosphates, Nitrates, Ammonia, Pollutant loadings.

This thesis is addressed to the methodologies of examining urban storm water runoff data by investigating relationships between the pollutant loading from each storm event and criteria such as runoff, the number of days since the last significant rainfall, and rainfall intensity. Sampling sites were located in North Philadelphia, Pennsylvania; and Trenton, Hamilton Township and East Windsor in New Jersey. Pollution parameters of concern for this paper are limited to nitrate expressed as nitrogen, suspended solids, chemical oxygen demand, 5-day BOD, total phosphates expressed as total phosphorus, and ammonia expressed as nitrogen. During the period of 6/1/76 to 10/1/77, 28 storm events were sampled. There appears to be some type of positive correlation between the pollutant loadings examined and the amount of runoff. However, the correlation is different for each site. In the realm of days since last significant rainfall versus pollutant loadings, no significant, outstanding, or consistent relationships were found, implying that there may be no basis to this concept. In general, the greater the intensity, the greater the pollutant loading. This was most strongly exhibited in the parameter of COD. The remaining parameters, except suspended solids, showed this tendency also.
W79-03689

MOTORBOAT USE ON THE WILD ROGUE RIVER: AN INVESTIGATION OF USE BETWEEN WATSON CREEK AND BLOSSOM BAR,
Oregon State Univ., Corvallis. Dept. of Geography.
P. E. Donheffner, and K. W. Muckleston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 593, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Oregon State University Report WRRI-52, December 1976. 60 p, 6 fig, 8 tab, 7 append. OWRT A-999-ORE(21)

Descriptors: *Recreation, *Motorboat pollution, River recreation, Riverine planning, *Wild Rouge River(Ore), *Oregon, Water utilization, Monitoring.

A study of private motorboat use on the lower nine miles of the Wild Rogue River was conducted to determine present and historical use levels. Motorized use was monitored daily, and a survey of private motorboaters undertaken using personal interviews. There is a long history of motorboat use in the study area; it was well established by 1968 when part of the Rogue was designated as a Wild River. All types of motorized use have increased since then, especially commercial and administrative use. Private use in 1976 is estimated at 1,000 trips, not all of which were recreational. There is considerable variation in the spatial and temporal patterns of use; over 30 percent of all private use takes place in September and October. Fishing is the primary reason for private motorboat use. The greatest problem reported by private motorboaters was discourtesy by downriver, drift users.
W79-03695

FATE OF 2, 4-D IN A NAFF SILT LOAM SOIL,
Nebraska Univ. Panhandle Station at Scottsbluff
R. G. Wilson, Jr., and H. H. Cheng
Journal of Environmental Quality, Vol. 7, No. 2, p. 281-286, April-June, 1978. 3 fig, 4 tab, 16 ref.

Descriptors: *Adsorption, *Hydrolysis, *Chemical degradation, *Microbial degradation, Weed control, *2,4-D, Herbicides.

Laboratory studies were conducted to determine the adsorption, desorption, hydrolysis, and breakdown of commercially formulated isooctyl ester and dimethylamine salt of (2,4-dichlorophenoxy) acetic acid (2,4-D) in a Naff silt loam soil. More 2,4-D was adsorbed to the surface soil than to soil at lower depths, and the percentage of 2,4-D adsorped decreased as the total amount of 2,4-D present increased. Formulated 2,4-D isooctyl ester applied to moist soil underwent hydrolysis to the anionic form at a rapid rate, with less than 80 percent of the ester hydrolyzed in 72 hours. High amounts of 2,4-D in runoff (sediment and water) retarded the active degradation of carboxyl-14C 2,4-D when 2,4-D was incubated in runoff from a wheat field treated with various formulations and rates of 2,4-D. The presence of the ester formulation at the high rate of application increased the lag period before degradation of carboxyl-14C and ring-14C 2,4-D occurred in soil. However, once the active breakdown of carboxyl-14C and ring-14C 2,4-D was initiated, little difference could be detected in the degradation patterns. At the end of the 10 weeks of incubation in runoff or in soil, only 1 percent of the 14-C 2, 4-D originally applied to the soil could be identified as 2,4-D. (Skogerboe-Colorado State)
W79-03702

COMPARATIVE STUDY OF TOXICITY, UPTAKE AND DISTRIBUTION OF CADMIUM AND MERCURY IN THE SEA WATER ADAPTED EEL ANQUILLA ANQUILLA,
Liege Univ. (Belgium). Lab. d'Oceanologie.
F. Noel-Lambot, and J. M. Bouquegneau.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 4, p. 418-424, 1977. 1 fig, 1 tab, 26 ref.

Descriptors: *Mercury, *Cadmium, *Toxicity, Mortality, Spectrophotometry, Absorption, Membrane processes, *Eels, Lethal limit, Permeability, Path of pollutants, Animal metabolism, Chlorides, Metals, Tissue analysis, Bioaccumulation, Anquilla, Gills.

Toxicity test results show that eels are much more susceptible to HgCl2 exposure than to CdCl2 exposure. In terms of tissue distribution, maximum concentrations were attained in the kidneys in both cases. Next came the digestive tract and the liver in the case of Cd, the spleen, the gills and the liver in the case of Hg. When result were expressed as organ metal load compared to whole body content, the digestive tract, kidneys, and liver contained 56% of the total Cd, while 66% of the total Hg was concentrated in the muscles. (Katz-EIS)
W79-03730

MICROBIAL POPULATIONS IN FLOODED SWAMP SOILS OF SOUTH CAROLINA,
Southeastern Forest Experiment Station, Asheville, NC.
For primary bibliographic entry see Field 2G.
W79-03742

A CONCEPTUAL MODEL FOR THE MOVEMENT OF PESTICIDES THROUGH THE ENVIRONMENT: A CONTRIBUTION OF THE EPA ALTERNATIVE CHEMICALS PROGRAM,
National Ecological Research Lab., Corvallis, OR.
J. W. Gillett, J. Hill, IV, A. W. Jarvinen, and W. P. Schoor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-238 653, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-660/3-74-024, December 1974. 86 p, 21 fig, 42 ref. 1EA487.

Descriptors: *Model studies, *Ecosystems, *Pesticides, Pesticide drift, Pesticide kinetics, Pesticide residues, Movement, Path of pollutants, Food chains, Theoretical analysis, Systems analysis.

A conceptual model of the movement and disposition of pesticides in the environment is developed in order to permit judicious collection and evaluation of data at the critical points in that disposition. It is the first step in organizing facts, assumptions, and hypotheses into a logical, graphic array which can ultimately be exploited through the use of systems analysis and mathematical simulation techniques to evaluate the fate of a specific chemical in a particular environment. A graphic model is built up from simple modules representing basic processes and components of air, flora, fauna, soil and water, as well as mechanisms of disposition such as convective mass transport, interparticle diffusion, co-distillation, condensation, intra-particle diffusion, ingestion, adsorption/desorption, chemical transformation, and biological alteration. These elements were used in the development of more specific models for the atmospheric/terrestrial, freshwater aquatic and estuarine/marine environments. While the concept of a model with global validity was rejected, the commonalities of the basic processes and components in these environments was emphasized, and it was suggested that through iterative operations of expansion and systematic reduction of processes and components, these environments could be joined to provide a holistic view of a chemical's disposition and effects. (Luedtke-Wisconsin)
W79-03757

THE BEHAVIOR OF NUTRIENT ELEMENTS ADDED TO A FOREST SOIL WITH SEWAGE SLUDGE,
Washington Univ., Seattle. Center of Ecosystem Studies.
H. Riekerk.
Soil Science Society of America, Vol. 42, No. 5, p 810-816, September-October 1978. 5 fig, 1 tab, 23 ref.

Descriptors: *Sewage sludge, *Forest soils, *Nutrient removal, On-site investigations, Nutrients, Groundwater, Leaching, Rainfall, Nitrogen, Phosphorus, Potassium, Calcium, Anions, Cations, Ion exchange, Hydrogen ion concentrations, Groundwater movement.

Sludge applications were made at a rate of 247 metric tons/ha dry weight to a cleared gravelly Douglas fir forest soil to test limits of nutrient conservation mechanisms. First year losses due to treatments were 8% of added N, 15% of Ca, 1% of K, and none of P. Predictably, NO3-N was the dominant mobile anion significantly increasing the calcium nitrate level in the groundwater. Differences between sludge treatments, including plowing, reflected the degree of aeration and decomposition of NO3-N production and P-fixation. These differences were more pronounced deeper in the soil, except for K which was more controlled by the stage of weathering. A very heavy sludge application rate (618 metric tons/ha) had less impact on soil nutrient behavior due to a high water absorption capability. Alternate ways of reducing NO3-N leakage from the forest soil are being investigated. (Sims-ISWS)
W79-03805

POTENTIAL SOURCES OF ASBESTOS IN LAKE MICHIGAN,
Illinois Univ. at the Medical Center, Chicago. School of Public Health.
C. S. Hesse, and W. H. Hallenbeck.
Journal of Great Lakes Research, Vol. 4, No. 1, p 57-61, March 1978. 37 ref.

Descriptors: *Asbestos, *Lake Michigan, *Water pollution sources, Water pollution, Industries, Geology, Atmosphere, Currents(Water), Dredging, Pollutants, Path of pollutants, Lakes, Surveys.

Chrysotile and amphibole mineral fibers, recognized carcinogens, have been found in Lake Michigan water. Since the sources of these fibers in Lake Michigan are unknown, a study was undertaken to determine potential sources. Information was gathered by contacting governmental agencies and reviewing literature. Two industries that used to discharge asbestos-containing effluents are located in the Lake Michigan drainage basin. Geologic deposits of mineral fibers occur in Marinette County, Wisconsin, and the Upper Peninsula of Michigan. Currents and Army Corps of Engineers dredging and disposal activities were investigated as potential mechanisms of asbestos distribution in Lake Michigan. Limited environmental monitoring indicated that atmospheric loading and wash-out from numerous point and non-point sources may be an important mechanism of asbestos contamination of Lake Michigan. More environmental monitoring will be required in order to determine the relative importance of these potential sources. (Sims-ISWS)
W79-03809

MIREX IN THE SEDIMENTS OF LAKE ONTARIO,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
M. V. H. Holdrinet, R. Frank, R. L. Thomas, and L. J. Hetling.
Journal of Great Lakes Research, Vol 4, No 1, p 69-74, March 1978. 2 fig, 4 tab, 12 ref.

Descriptors: *Pesticides, *Sediments, *Lake Ontario, Sampling, Surveys, Distribution patterns, Water pollution, Water pollution sources, Suspended solids, Chemical analysis, Insecticides, Rivers, Runoff, Lakes, Lake sediments, *Mirex.

Analysis of sediment samples collected in Lake Ontario in 1968 revealed the occurrence of mirex in two anomalous zones related to input from the Niagara and Oswego Rivers. These anomalies were confirmed in a 1976 resampling program. A suspended solids sample taken in the Niagara River confirmed an upstream source (Hooker Chemical) of the compound. Bottom sediment samples in the Oswego River identified an industrial source (Armstrong Cork) 14 km upstream of the river mouth. Known use of mirex by this plant indicated a substantial loss some 15 years ago. This was confirmed by sediment coring in the open lake sediments indicating that mirex deposition commenced 7 to 14 years before present. (Sims-ISWS)
W79-03810

THEORETICAL MODEL OF THE LITTORAL DRIFT SYSTEM IN THE TORONTO WATERFRONT AREA, LAKE ONTARIO,
Scarborough Coll., Toronto (Ontario).
For primary bibliographic entry see Field 2H.
W79-03811

CARBON FLOW IN FOUR LAKE ECOSYSTEMS: A STRUCTURAL APPROACH,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W79-03815

THE MECHANISMS OF CARBON DIOXIDE FIXATION IN PHYTOPLANKTON,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
For primary bibliographic entry see Field 5C.
W79-03860

A MATHEMATICAL MODEL FOR GROWTH OF PHYTOPLANKTON,
Novo Industri A/S, Bagsvaerd (Denmark).
For primary bibliographic entry see Field 5C.
W79-03862

ACCUMULATION OF LEAD BY SEVERAL GREEN ALGAE,
Staatsinstitut fuer Allgemine Botanik, Botanischer Garten und Anzuchtgarten Fuhlsbuettel, Hamburg (Germany, F.R.).
For primary bibliographic entry see Field 5C.
W79-03867

N-UPTAKE AND PIGMENTATION OF N-LIMITED CHEMOSTAT CULTURES AND NATU-

RAL POPULATIONS OF OSCILLATORIA AGARDHII,
Amsterdam Univ. (Netherlands). Lab. for Microbiology, Amsterdam (Netherlands).
For primary bibliographic entry see Field 5C.
W79-03868

EFFECTS OF RIVER DISCHARGE ON THE COASTAL PHYTOPLANKTON CYCLE,
Norwegian Fisheries Directoriate, Arendal, Statens Biological Station.
For primary bibliographic entry see Field 5C.
W79-03873

A STEADY-STATE PHYTOPLANKTON MODEL OF CHESAPEAKE BAY,
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W79-03899

SIMULATION OF POTENTIAL POLLUTANT-CAUSED CHANGES IN THE ECOSYSTEM, RESULTING FROM THE SENSITIVITY OF AQUATIC ORGANISMS TO TOXICANTS,
Moscow State Univ. (USSR). Faculty of Biology.
For primary bibliographic entry see Field 5C.
W79-03920

GEOLOGIC POLLUTION PROBLEMS OF LAKE SUPERIOR,
A. B. Dickas.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 133-140, 1978, 1 tab., 16 ref.

Descriptors: *Lake Superior, *Water quality, *Public health, Erosion, Erosion rates, Clay minerals, Clays, Red clay, *Asbestos, Cummingtonite, Mining, Mining wastes, Water pollution effects, Waste treatment, Geologic pollution.

The effects of man's activities on the water quality of Lake Superior are reviewed. As a result of mining activities, cummingtonite and other asbestos type minerals have been discharged into Lake Superior. The possible effects of these discharges are discussed. The water quality of Lake Superior are also affected by the extensive erosion of red clay deposits. (See also W79-03906) (EIS-Katz)
W79-03938

NATIONAL CONFERENCE ON MANAGEMENT OF NITROGEN IN IRRIGATED AGRICULTURE.
For primary bibliographic entry see Field 5G.
W79-03941

SOURCES OF NITROGEN FOR CROP UTILIZATION,
Potash/Phosphate Inst. Manhattan, KS.
For primary bibliographic entry see Field 5G.
W79-03944

ESTIMATING THE INFLUENCE OF SOIL RESIDENCE TIME ON EFFLUENT WATER QUALITY,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5G.
W79-03951

A CASE STUDY-NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
R. S. Ayers.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p. 355-367, 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Nitrates, *Nitrogen, Water management(Applied), Fertilization, Waste disposal, Pollutant identification, *California, *Santa Ana River(Calif), *Groundwater, Water pollution.

In response to a request from the Santa Ana Watershed Planning Agency (a regional planning agency) the Kearney Foundation of Soil Science of the University of California conducted an interdisciplinary 3-month study of the nitrate problem in the Basin. The study was limited to the upper part of the basin where nitrate degradation of waters was more serious. The study included (1) a review of available data to identify existing areas of high nitrate concentrations in underground waters, (2) a review of past land use, water and fertilizer use and waste disposal practices, and (3) estimates of the impact of irrigation, fertilization and use of animal wastes on leaching of nitrate from root zones. Guidelines for the use of water, fertilizers and manures were developed. (See also W79-03941) (Skogerboe-Colorado State)
W79-03955

PCBS: THEIR ENVIRONMENTAL SIGNIFICANCE AND DISTRIBUTION IN RHODE ISLAND,
Rhode Island Univ., Narragansett. Coastal Resources Center.
A. J. Paulson, and D. T. Brown.
Sea Grant Program, Marine Technical Report No. 68, July 1978. 29 p, 2 fig, 6 tab, 44 ref

Descriptors: *Polychlorinated biphenyls, *Water pollution sources, *Toxicity, Chemistry, Rhode Island, Landfills, Waste disposal, Path of pollutants, Water quality control.

Summary information on PCB chemistry, sources, transport mechanisms, and toxicity, with focus on the marine environment is provided. The existing data on PCBs in Rhode Island are presented and assessed in the second part of the report. From this review and assessment the following conclusions can be made: PCBs, although present in the Rhode Island environment, are not a major pollution problem. Data on PCBs in Rhode Island ecosystems are scanty. Additional information would provide a clearer picture of PCB distribution but it is not considered to be of high priority, since the available data suggest that present levels are low. (NOAA)
W79-03964

SOURCE ASSESSMENT: OPEN MINING OF COAL, STATE OF THE ART,
Monsanto Research Corp., Dayton, OH
For primary bibliographic entry see Field 5G
W79-03969

OVERVIEW OF THE FRESH PACK FOOD INDUSTRIES.
SRI International, Menlo Park, CA.
L. R. Somogyi, and P. E. Kyle
Report No EPA-600/2-78-216, December 1978. 110 p, 10 fig, 22 tab, 27 ref. R804642-01.

Descriptors: *Industrial wastes, Agriculture, *Water pollution sources, *Foods, *Organic wastes, Water users, Effluents, Apples, Citrus fruits, Grapefruit, Fruit crops, Lemons, Lettuce, Onions, Potatoes, Vegetable crops, Salmon, Marine fish, Oysters, Nuts, Fresh foods, Eggs, Fresh produce, Waste disposal, Solid wastes, Organic wastes, Waste water(Pollution).

Substantial amounts of water are used, and organic wastes are produced during market preparation of most fresh fruits, vegetables, fish, and shell eggs. In assessing the pollution contributions of the fresh produce handling industry, the common unit operations applied after harvest, the water usage and waste disposal associated with the ten highest volume crops were reviewed. Two nut crops, two species of fish, and fresh eggs were included in the investigation because if their special handling requirements. It was found that although the industries are not a major source of air pollutants, they are major sources of solid wastes in the form of natural organic substances. Much of these wastes are returned to the field, or used as byproducts, fuel, or feed, with only small amounts handled in central locations where they may periodically create local problems when disposed to urban sewage systems. In addition to washing, cleaning water is used for transporting fruits through grading and inspection systems, and for cooling fresh fruits, fish, and vegetables. Large volumes of waste water containing various strengths of organic pollutants are created. Significant quantities of water are used in the market preparation of apples, oranges, lemons, and potatoes. The waste water contains some detergent compounds applied during the cleaning processes; cleaning water and cooling water are often treated with germicides. Chlorine is the most common germicide. Pesticide residues and potentially hazardous chemicals are used at very low concentrations, and are not likely to harm the environment. (Davison-IPA)
W79-03970

ASSESSMENT OF POTENTIAL TOXIC RELEASES FROM LEATHER INDUSTRY DYEING OPERATIONS,
SRI International, Menlo Park, CA.
S. B. Radding, J. L. Jones, W. R. Mabey, and N. Bohonos.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 790, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-215, October 1978. 71 p, 4 fig, 19 tab, 12 ref, 2 append. 804642-01-2.

Descriptors: *Industrial wastes, *Tannery wastes, *Organic wastes, *Toxicity, *Waste water, Dyes, Biosorption, Effluents, Dye releases, Dye concentrations, Water pollution sources, Water pollution effects, Color, Waste water treatment.

A study of the organic dyes released to the environment in the waste waters from leather dyeing processes is reported. Acid, basic, direct, and metallized dyes are the dye types used by the leather industry, with acid and direct dyes used by the leather industry, with acid and direct dyes predominating. One plant can use as many as 100 dye formulations. Over 50 dyes have been identified as being used by tanneries; 49 of these are listed with structural formulas indicating the range of materials used. Most tanneries discharge their complex effluents directly into municipal sewers. The character of these waste streams is inconsistant because tannery operations are batch mode which very daily. Little information is available concerning the fate of the dyes released to the environment. The probable discharge of dyes in waste water is estimated based on information from suppliers and tanners. The most likely mechanism for biological removal of dyes in waste water treatment systems appears to be biosorption. The tanning industry structure, its processing operations, the types of raw materials required, the potential process sources of emissions to the environment, and environmental control practices are described. (Davison-IPA)
W79-03972

INVESTIGATION OF LANDFILL LEACHATE POLLUTANT ATTENUATION BY SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. H. Fuller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 995, Price codes: A11 in paper copy, A01 in microfiche. Report No EPA-600/2-78-158, August 1978. 219 p, 41 fig, 104 tab, 91 ref, 5 append. 68-03-0208.

Descriptors: *Water pollution, *Groundwater, *Soil chemistry, *Leachate, *Soil permeability, Municipal wastes, Industrial wastes, Contamination(Soil), Solid wastes, Leaching, Arsenic, Beryllium, Cadmium, Copper, Chromium, Lead, Mercury, Selenium, Zinc, Iron, Clay, Lime, Iron oxides, Total organic carbon(TOC), Chemical oxygen demand(COD).

Because of the importance of soil and earth materials in retarding or preventing movement of pollut-

ants into groundwater, an investigation was made of the movement and retention of a variety of pollutants when they were carried by municipal solid waste leachate through soils. A laboratory study was conducted using 11 soils from 7 major orders throughout the U.S. and municipal landfill leachate alone, and spiked with pollutant metals in concentrations expected from highly polluted leachates of municipal and industrial wastes. Metals included arsenic, beryllium, cadmium, iron, mercury, nickel, lead, selenium, vanadium, and zinc. Attenuation of these substances was found to be a function of their individual properties, permeability of the soil, and the amounts of clay, lime, and hydrous iron oxides in soil. Amounts of elements retained by soils after extraction with water and 0.1 N HCl suggest that soils have substantial permanent retention capacity. Total Organic Carbon (TOC) and Chemical Oxygen Demand (COD) in unspiked leachates were not significantly retained by any soil. However, because of materials displaced from the soil, the COD in soil column effluents was initially 30 to 50 times higher than COD in the applied leachate, but rapidly decreased to the same level. TOC in soil column effluents rapidly increased to the level of TOC in the applied leachate; on subsequent leaching with water, essentially all applied TOC was eluted. Data obtained during testing were used to develop and partially validate a simulation model for predicting solute concentration changes during leachate flow through soils. (Majtenyi-IPA)
W79-03983

A CASE STUDY OF HAZARDOUS WASTES IN CLASS I LANDFILLS,
Southern California Univ., Los Angeles. Environmental Engineering Program.
B. Eichenberger, J. R. Edwards, K. Y. Chen, and R. D. Stephens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 937, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-064, June 1978. 114 p, 20 fig, 44 tab, 36 ref, 5 append. R-803813.

Descriptors: *Pollutant identification, *Oil wastes, *Landfills, *Chemical wastes, Soil contamination, Water pollution sources, Industrial wastes, Liquid wastes, Municipal wastes, Los Angeles, Hazards, Metals, Water pollution, Groundwater, Surface waters, Sodium, Iron, Calcium, Zinc, Potassium, Magnesium, Copper, Chromium, Nickel, Lead, Barium, Manganese, Vanadium, Cadmium, Arsenic, Beryllium, Silver.

A total of 320 waste samples were collected from five landfill sites in the Los Angeles area, and consolidated into 99 samples representative of 17 industrial types. The sites received an estimated combined daily volume of 2.3 x 10(6) l/day of hazardous wastes. The average daily deposition and partitioning of 17 metal species for all five sites were documented. The data were summarized for the six general industrial groups: petroleum, chemical, industrial cleaning, metal, food, and miscellaneous/unknown. The results indicate that copper, chromium, and zinc wastes present the greatest potential threat to groundwater and surface supplies in consideration of total mass deposition, weight percent in the soluble phase (42% to 86%) and maximum concentration levels (14,000 to 20,000 mg/l). The combined results for the five sites studied are considered to be representative of the hazardous stream generated in the greater Los Angeles area. (Davison-IPA)
W79-03984

FACTORS INFLUENCING THE VOLATILIZATION OF MERCURY FROM SOIL,
Environmental Monitoring and Support Lab., Las Vegas, NV.
R. D. Rogers, and J. C. McFarlane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 179, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA-600/3-78-054, May 1978. 19 p, 8 fig, 2 tab, 19 ref.

Descriptors: *Mercury, *Volatility, *Soil chemistry, *Soil microorganisms, *Soil amendments, *Soil physical properties, Soil texture, Evaporation, Soil sterilization, Clay loam, Loam, Microbial degradation.

The volatilization of mercury from amended soils, the rate of loss, the chemical and biological availability of mercury in soil, and whether such volatility is of a biological origin, was investigated. Two soils, a loamy sand a silty clay-loam, were amended to 1 ppm with mercuric nitrate. Volatilization ceased within one week after amendment; 20% of the mercury was lost from the silty clay-loam, and 43% from the loamy sand. Steam-autoclaved sandy soil amended with mercury indicated that volatilization was the result of microbial action, and that the rate of volatilization was determined by the availability of mercury to the microbes. (Davison-IPA)
W79-03988

DISTRIBUTION OF PHYTOPLANKTON IN ILLINOIS LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03989

DISTRIBUTION OF PHYTOPLANKTON IN NORTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03990

DISTRIBUTION OF PHYTOPLANKTON IN INDIANA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-03991

FATE OF 3,3'-DICHLOROBENZIDINE IN AQUATIC ENVIRONMENTS,
Syracuse Research Corp., NY. Life Sciences Div.
H. C. Sikka, H. T. Appleton, and S. Banerjee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 526, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/3-78-068, July 1978. 50 p, 21 tab, 5 fig, 42 ref.

Descriptors: Freshwater fish, *Bioassay, Mortality, *Toxicity, Sediments, Public health, Degradation(Decomposition), Sunfish, Freshwater, *Aromatic compounds, Dyes, Pigments, Activated sludge, Aquatic environment, Aquatic microorganisms, *Dichlorbenzidine, Environmental control.

Several aspects of the aquatic environmental fate of 3,3'-dichlorobenzidine (DCB), a suspected human carcinogen, were examined. Greater than 95% of dichlorobenzidine present was adsorbed to natural pond and lake sediments in aqueous suspensions. Only a portion of the adsorbed chemical could be extracted from the sediments, with this amount decreasing over time, suggesting chemical reaction of DCB with sediment constituents. Dichlorobenzidine was rapidly degraded by natural and artificial light in aqueous solution, with a half-life of the order of 90 seconds in natural sunlight. Monochlorobenzidine and a benzidine were found to be intermediate products of this process. In contrast, DCB appeared recalcitrant to degradation by naturally occurring aquatic microbial communities with only a minor loss of chemical detected over a 30-day incubation period. Dichlorobenzidine was rapidly bioconcentrated in bluegill sunfish, with mortality occurring prior to establishment of a chemical equilibrium between water and fish. Bioconcentration factors of 132-554 were achieved at this point. The only metabolite detected in the fish was an acid-labile conjugate of DCB. Based on these observations, chemical and physical processes, rather than biological ones, appear to be the important factors governing the fate of DCB in the aquatic environment. The ability of DCB to concentration in aquatic organisms may pose a direct hazard to human health through consumption of contaminated fish.
W79-03998

FATE AND IMPACT OF PENTACHLOROPHENOL IN A FRESHWATER ECOSYSTEM,
University of Southern Mississippi, Hattiesburg. Inst. of Environmental Science.
R. H. Pierce, Jr.
Environmental Protection Agency, Report EPA 600/3-70-063 July 1978. 62 p, 28 tab, 7 fig, 41 ref.

Descriptors: *Phenol, Toxicity, Fish kills, *Water pollution effects, Environmental effects, Path of pollution, Biodegradation, Persistence, Sunfishes, Freshwater fish, Fish food, Laboratory tests, Ecosystem, Public health, *Pentachlorophenol, *Chlorinated phenols, Food chain bioaccumulation, *Degradation products, Subletha! concentration, Freshwater ecosystems.

This investigation was undertaken to determine the fate of pentachlorophenol (PCP) that caused extensive fish kills in a freshwater lake in December 1974 and again in December 1976. The kills resulted from the accidental release of wood-treating wastes containing PCP in fuel oil. Food chain relationships were investigated in the lake and the accumulation and elimination of sublethal concentrations of dissolved PCP was studied under laboratory conditions for the bluegill (Lepomis macrochirus). The highest concentrations of PCP in fish were observed in the bile followed by liver, gills, and muscle. Lake sediment and leaf litter contained high concentrations of PCP throughout the two-year study. Studies of leaf litter from the contaminated water shed area showed it to be a source for chronic pollution of the aquatic ecosystem. The major degradation products observed were pentachloroanisole (PCP-OCH3) and the 2,3,5,6- and 2,3,4,5-tetrachlorophenol (TCP) isomers. These products were found to persist in sediment and fish along with PCP. The methyl ethers (anisoles) of both TCP isomers and the 2,3,4,6-TCP isomer were observed in some samples but the small amounts were difficult to quantitate. (EIS-Katz)
W79-03999

5C. Effects Of Pollution

ISOLATION OF A MERCURIC CHLORIDE-TOLERANT BACTERIUM AND UPTAKE OF MERCURY BY THE BACTERIUM,
Gifu Univ. (Japan). Dept. of Agricultural Chemistry.
H. Horitsu, M. Takagi, and M. Tomoyeda.
European Journal of Applied Microbiology and Biotechnology, Vol. 5, p. 279-290, 1978. 17 fig, 6 tab, 12 ref.

Descriptors: *Mercury, *Pseudomonas, *Biological membranes, *Tolerance, Bacteria, Electron microscope, Membrane processes, Cytological studies, Cadmium, Chromium, Copper, Heavy metals, Biochemistry, Carbohydrates, Chemical analysis, Proteins, Metabolism, Systematics, *Bacteria, *Mercuric chloride.

A mercuric chloride-tolerant bacterium is isolated from activated sludge and the bacterium was identified as Pseudomonas oleovorans. The bacterium is tolerant up to 350 ppm Hg+, 100 ppm Cd2+, 40 ppm Cr6+, and 1000 ppm Cu2+. Observation by scanning electron microscope of cells growing with mercury shows a less rigid structure of the cell surface than in the case of controls, while observation by transmission electron microscope shows many electron-dense granules in the cytoplasm of cells growing with mercury. By chemical analysis, about 80% of mercury taken up by the cells was found in the cytoplasm, and about 20% in the cell envelope fraction, of the resting cells used. Mercury was found in the supernatant fluid, but not in the microsomal fraction. (EIS-Deal)
W79-03501

EFFECT OF HEXACHLOROBENZENE (HCB) ON THE ACTIVITY OF SOME ENZYMES FROM TETRAHYMENA PYRIFORMIS,
Biologische Bundesanstalt fuer Land und Forstwirtschaft, Berlin (Germany, F.R.). Inst. fuer Nichtparasitare Pflanzenkrankheiten.
F. Geike.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p. 640-646, 1978. 1 tab, 36 ref.

Descriptors: *Enzymes, *Toxicity, *Protozoa, Metabolism, Cytological studies, Food chains, Chemical analysis, Path of pollutants, Biochemistry, Proteins, Organic compounds, Biological membranes, Insecticides, Chlorinated hydrocarbon pesticides, *Hexachlorobenzene, *Tetrahymena, Benzene hexachloride.

Tetrahymena pyriformis cultures were treated with three different levels of HCB in controlled studies. At a dose level of 0.001 ppm the activity of delta-aminolevulinate dehydratase, hexokinase, and pyruvate kinase remained unaffected but was increased for glutamic-oxaloacetic transaminase, glutamic dehydrogenase, isocitrate dehydrogenase, and malate dehydrogenase while 0.1 ppm HCB increased the activity of all enzymes studied, the only exception being glutamic-pyruvic transaminase, the activity of which was depressed by HCB exposure. A concentration of 1.0 ppm HCB depressed the activity of most of the enzymes below control values with the exception of the two mitochondrial enzymes, MDH and ICDH, studied here. (EIS-Deal)
W79-03502

THE EFFECT OF ENDRIN ON THE HISTOPATHOLOGICAL CHANGES IN THE LIVER OF CHANNA PUNCTATUS,
D.A.V. Coll. Muzaffaragar (India). Dept. of Zoology.
K. V. Sastry, and S. K. Sharma.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 674-677, 1978. 3 fig, 19 ref.

Descriptors: *Endrin, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, Cytological studies, Fish physiology, Fish diseases, Animal pathology, Toxicity, Path of pollutants, Water pollution effects, Pesticide kinetics, Chemical analysis, Tissue analysis, Liver, *Histology, *Channa.

Treatment with endrin produced acute pathological changes in the liver of Channa punctatus. Eight hours after injection the liver was characterized by hypertrophy of hepatocytes. The toxic changes were more severe in the centrolobular area than in the perilobular area. By 24 hours there was marked hypertrophy of the hepatic cells. Cell necrosis was severe, with the cell membranes in most cells ruptured. The histopathological changes observed here are not characteristic of endrin alone. A number of organochlorine compounds are known to produce similar toxic effects. (EIS-Deal)
W79-03503

EFFECTS OF SOME TRACE ELEMENTS ON THE BLOOD OF KUWAIT MULLETS LIZA MACROLEPIS (SMITH),
Kuwait Inst. for Scientific Research.
M. M. Helmy, A. E. Lemke, P. G. Jacob, and B. L. Oostdam.
Journal of Experimental Marine Biology and Ecology, Vol 34, p 151-161, 1978. 2 tab, 62 ref.

Descriptors: *Lead, *Mercury, *Copper, *Toxicity, *Mullets, Heavy metals, Trace elements, Bioassay, Animal pathology, Fish physiology, Chemical analysis, Bioindicators, Fish diseases, Cytological studies, Biochemistry, Tissue analysis, *Liza, *Histology, Hematology.

Haemopathological changes attributed to heavy metal poisoning were observed in blood smears of Liza macrolepis taken after exposure of 96 h to graded doses of copper, lead, and mercury in a flow-through marine bioassay system. In general, changes in leucocytic profile appear to be correlated with pathological changes caused by increasing copper and mercury concentrations. By contrast, blood samples of mullets exposed to lead, showed significant polychromasia and + 1 anisocytosis regardless of concentrations. The RBC count, haemoglobin content, and haemoglobin content, and haematocrit percentages were less valuable in dianosis of copper and mercury effects. These manifestations of poisoning by trace elements bear a resemblance to the pathological changes that have been shown clinically and experimentally in mammals. Consequently, blood measurements on marine organisms may be diagnostic of undesirably high levels of copper and mercury, and so may constitute useful indicators of marine pollution. (EIS-Deal)
W79-03504

ULTRASTRUCTURAL ALTERATIONS IN THE EGGSHELL GLAND EPITHELIUM OF THE MALLARD DUCK AFTER CHRONIC EXPOSURE TO DDT,
Edgewood Arsenal, Aberdeen Proving Ground, MD. Biomedical Lab.
G J Kolaja, and D E Hinton
Environmental Pollution, Vol. 17, p. 237-244, 1978. 5 fig, 17 ref.

Descriptors: *DDT, *Reproduction, *Bird eggs, *Mallard duck, Electron microscopy, Cytological studies, Calcium, Pesticide toxicity, Chlorinated hydrocarbon pesticides, Animal physiology, Animal pathology, Animal metabolism, Biochemistry, Biological membranes, Enzymes, Path of pollutants, Water pollution effects, *Histology

The effects of chronic ingestion of DDT were studied on the ultrastructure of the eggshell gland of the mallard duck. Ultrastructural changes seen were oedema of the Type II epithelium cells, as demonstrated by decreased electron density, and vacuoles in the endoplasmic reticulum. Since the Type II cells are responsible for the transport of calcium, alterations in these cells indicate that decreased calcium transport may be responsible for DDT-induced eggshell thinning. (EIS-Deal)
W79-03506

UREA FERTILIZATION OF NATURAL FOREST: EFFECTS ON WATER QUALITY,
Laurentian Forest Research Centre, Quebec (Ontario).
A. Gonzalez, and A. P. Plamondon.
Forest Ecology and Management, Vol 1, No 3, November 1977, p 213-221. 1 fig, 22 ref

Descriptors: *Ureas, *Fertilization, *Forest watersheds, *Water pollution effects, *Water pollution sources, *Streams, Nutrients, Nitrogen, Montmorency Experimental Forest(Quebec-Canada), Canada, Lumbering, Fertilizers, Ammonium, Conductivity, Nitrates, Rainfall, Balsam fir trees, White spruce trees, Birch trees

Fertilization with urea at a rate of 150 kg N/ha of a 120-ha forest watershed in Laval University's Montmorency Experimental Forest 80 km north of Quebec, Canada in June and September 1973 had no significant effect on water quality. A contiguous 120-ha watershed served as control. Only ammonium and conductivity increased significantly in stream water in the 10-15 days following application; nitrate increased slightly for a short time, and other parameters exhibited small changes. Urea was identified only at trace levels during the 48 hrs after fertilization, and only ammonium was temporarily above international drinking water guidelines. Storm intensity strongly influenced water quality response to fertilization; abundant rainfall coincided with the application. The watersheds were covered with a natural stand of 80% balsam fir, 10% white spruce, and 10% white birch. Altitude is 783-994 m, trees average 30 years old, mean terrain slope is 20%, and average precipitation is 140 cm. This type of forest represents 25% of the logging potential of Quebec Province. Samples were collected manually in a turbulent section in the lower part of the main drainage stream in each watershed. Parameters determined were DO, pH, conductivity, turbidity, color, nitrogen, organic carbon, metal cations, and filterable residues. Several factors reduce the effects of forest fertilization on water quality, compared with agricultural fertilization. (Lynch-Wisconsin)
W79-03507

THE DECLINE OF LAKE PLANTS,
R. L. Stuckey.
Natural History, Vol 87, No 7, August-September 1978, p 66-69.

Descriptors: *Lakes, *Aquatic plants, *Put-in-Bay(OH), *Lake Erie, *Water pollution effects, *Limiting factors, Macrophytes, Submerged plants, Floating plants, Turbidity, Water level fluctuations, Great Lakes, Ohio, Soil erosion, Dredging, Recreation, Succession, Dissolved oxygen, Water temperature, Islands, South Bass Island(OH), Harbors, Bays, Vallisneria americana.

Aquatic macrophytes in Put-in-Bay harbor on the north shore of Ohio's South Bass Island in western Lake Erie have declined from 40 species in 1898 to 20 in 1967-70 because of: (1) water level fluctuations; (2) increased water temperature; (3) increased turbidity from erosion, dredging, and shoreline construction; (4) decreased dissolved oxygen; and (5) increased recreation. Surveys of submersed, floating, and emersed plants were made in 1898 (Pieters), 1934 (Tiffany), 1949 (Core), and 1967-70 (the present study). Of Pieter's 40 species, eight had disappeared by 1934, and 14 by 1949. Of the 20 remaining in 1967-70, only one (Vallisneria americana) was abundant, two were common, eight were occasional, and nine were rare. There have been few changes since 1967. Rush-like plants which lined the shore of Squaw Harbor (a section of Put-in-Bay) in 1898 were almost eliminated by 1949 due to construction of boat docks, and small colonies of seven emersed species observed along the shoreline in 1967 had disappeared by 1970 following a sudden rise in lake water level and increased boat traffic. The 13 species of submersed plants recorded for Squaw Harbor in 1949 were reduced to seven by 1967-70. By 1949 few plants were found at all in the main harbor, true also in the late 1960s. Of the 20 species no longer present in Put-in-Bay harbor, 11 occur principally in cool-water habitats primarily north of Lake Erie, while 14 of the 20 surviving species from Pieter's survey have widespread distributions. (Lynch-Wisconsin)
W79-03508

ON THE RELATION OF ORGANOTROPHY OF MARINE UNICELLULAR ALGAE TO THE DENSITY OF THEIR EXPERIMENTAL POPULATIONS AND INDIVIDUAL WEIGHTS OF CELLS,
Institute of Biology of the Southern Seas, Sevastopol (USSR)
K. M. Khailov, Z. P. Burlakova, L. A. Lanskaya, and N. A. Lavrentyev
Marine Science Communications, Vol 4, No 2, 1978, p 153-173. 9 fig, 2 tab, 30 ref.

Descriptors: *Organotrophy, *Marine algae, *Cell weight, *Cell density, *Organic compounds, Unicellular algae, Algae, Weight, Biomass, Plant populations, Population dynamics, Density, Cultures, Gymnodinium kovalevskii, Gymnodinium lanskaya, Prorocentrum micans, Gyrodinium fissum, Peridinium trochoideum, Glenodinium foliaceum, Thalassiosira, Stephanopixis palmeriana, Chaetoceros affinis, Dinoflagellates, Diatoms, Glucose, Gylcolic acid, Plant physiology, Pyrrophyta, Chrysophyta.

Dependence in unicellular marine algae of the specific velocity of cell accumulation of dissolved organic substances (glucose and glycolic acid) on population density and individual cell weight was investigated with axenic cultures of nine dinoflagellates and diatom species. Density and weight together are inversely related to specific velocity. Moreover, the dependence of velocity on density may be approximated by exponential equations (given in a table) where the upper index approaches 1.0, the relationship between velocity and weight is similar, but equation parameters has not been defined. Most studies of algae (especially regarding organotrophy) have disregarded the influence of cell concentration in seawater, which

varies by as much as 10-10,000,000 cells/l. Data reported here show that cell densities greatly affect specific rates of organic solute consumption, and therefore data on such consumption cannot be satisfactorily interpreted without specifying population density. Species investigated were Gymnodinium kovalevskii, G. lanskaya, Prorocentrum micans, Gyrodinium fissum, Peridinium trochoideum, Glenodinium foliaceum, Thalassiosira sp., Stephanopixis palmeriana, and Chaetoceros affinis. Cultures in the logarithmic growth stage were used in the experiments, carried out in 100-ml bottles with algal densities of about 1,000-1,000,000 cells/l. Carbon-14-labelled glucose or glycolic acid were added at 0.2 mg/l. (Lynch-Wisconsin)
W79-03509

THE BLUE-GREEN ALGAE KEEP COMING,
E. F. Stoermer.
Natural History, Vol 87, No 7, August-September 1978, p 59-61.

Descriptors: *Eutrophication, *Great Lakes, *Phytoplankton, *Water pollution effects, *Phosphorus, Trophic level, Oligotrophy, Lakes, Algae, *Cyanophyta, Chlorophyta, Diatoms, Nutrients, Ecosystems, Succession, Limiting factors, Silicon, Nitrogen, Transparency, Lake Erie, Lake Superior, Zooplankton, Fish, Chrysophyta.

Increasing eutrophication of the Great Lakes is described, and mechanisms responsible for the change from diatom to cyanophyte dominance of phytoplankton are explained. Lakes Erie and Ontario are the most seriously affected, Lake Superior the least. Physical characteristics which have affected algal populations include: (1) small drainage relative to surface area and leaching-resistant bedrock resulted in nutrient-poor waters (except for nitrogen) in the pristine lakes; (2) tremendous heat-storing capacity as a result of their great mass restricts nutrient dispersal because of the thermal bar between enriched nearshore waters and the deep water; (3) only 10,000 years old, the lakes have less-well-adapted and less-resilient biota; and (4) their location on the boundary between the northern boreal forest zone and the humid temperature region, and their east-west orientation and mineral deposits encouraged migration of settlers to the Midwest. In pristine offshore waters, diatom dominated the phytoplankton, favored by low nutrient levels, relatively cold water, and limited light in deep water. With settlement of lake shores, phosphorus loading increased, reaching into the middle of the lakes and stimulating algal growth and algal uptake of other nutrients. Silicon, needed by diatoms, was depleted and blue-green and green algae not needing silicon became dominant. Diminished nitrogen levels eventually favored cyanophytes, along able to use atmospheric nitrogen. (Lynch-Wisconsin)
W79-03510

AN EXPERIMENTAL SIMULATION OF CHANGES IN DIATOM AND FLAGELLATE BLOOMS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
T. R. Parsons, P. J. Harrison, and R. Waters.
Journal of Experimental Marine Biology and Ecology, Vol 32, No 3, May 1978, p 285-294. 4 fig, 22 ref.

Descriptors: *Diatoms, *Flagellates, *Phytoplankton, *Eutrophication, *Light intensity, *Nitrates, Limiting factors, *Succession, *CEPEX Program, *Controlled experimental ecosyste, Nutrients, Phosphorus, Chlorophyta, Dinoflagellates, Food chains, British Columbia(Canada), Canada, Oceans, Pacific Ocean, Gonyaulax catenella, Simulation analysis.

An enclosed plastic cylinder (Controlled Experimental Ecosystem, or CEE) 23 m deep and 9.5 m diameter containing about 1300 cu m of seawater was floated in the coastal Pacific Ocean at Vancouver, British Columbia, Canada, (Cepex Project) to simulated phytoplankton succession from a diatom to a flagellate bloom through control of light and nutrients. Surface waters were kept mixed, and temperature increased from 11 C to more than 15 C during the 60-day experiment. Upwelling was varied by means of pumping from 22 m, and nutrients were added as KH2PO4, KNO3, and Na2SiO3-9H2O to raise nitrates from zero after day 5 to 0.5 microgram-at. NO3-N/l from day 5 to 30, and to over three micrograms/l by day 35. On day 38 a light shield was installed over the CEE to reduce average radiation in the top four m to 20% of the former level. Three blooms occurred: (1) a diatom bloom at the start (chlorophyll-a maximum of 10 mg/cu m); (2) a flagellate bloom after 32 days (chl-a maximum 3 mg/cu m); and (3) a diatom and flagellate bloom after 60 days (5 mg/cu m). There may exist in the ocean a diatom corridor of maximum growth leading to blooms, surrounded by a flagellate-dominated area, with both small and large cells. Diatom dominance occurs in high-nitrate environments (except when silicate is lacking). Flagellates dominate in low-light regimes, diatoms at higher light, and 'high-light' flagellates at still higher intensities. (Lynch-Wisconsin)
W79-03511

STIRRING INFLUENCES THE PHYTOPLANKTON SPECIES COMPOSITION WITHIN ENCLOSED COLUMNS OF COASTAL SEA WATER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, P. Koeller, and G. T. Wallace, Jr.
Journal of Experimental Marine Biology and Ecology, Vol 32, No 3, May 1978, p 219-239. 8 fig, 4 tab, 30 ref. NSF IS074-04838.

Descriptors: *Phytoplankton, *Diatoms, *Cell size, *Species composition, *Zooplankton, *Mixing, *CEPEX Program, *Controlled experimental ecosystem, Stirring, Coscinodiscus, Noctiluca, Pleurobrachia, Copepods, Ctenophora, Succession, Food webs, Coasts, Nutrients, Grazing, Predation, Copper, Settling velocity, Species diversity, Saanich Inlet(BC-Canada), Canada.

Stirring of seawater in two polyethylene cylinders 16.1 m deep by 2.4 m diameter (Controlled Experimental Ecosystems, or CEEs) at Saanich Inlet, Vancouver Island, British Columbia, Canada (CEPEX Project) maintained dominance of large-celled diatoms (Coscinodiscus spp), while in two unstirred CEEs microflagellates became dominant after 2-4 wks. Turbulent mixing of the quiescent water is needed to maintain in suspension large-celled phytoplankton with rapid sinking rates. In one CEE stirred to 15 m, large-celled species remained dominant over the entire experiment (31 August-14 October 1976), while in a CEE stirred only to 10 m phytoplankton cell diameter ultimately declined, apparently as a result of grazing pressure by herbivorous copepods (Noctiluca sp). It is thought that in the deep-stirred CEE such grazing was prevented by predation on the copepods by the ctenophore Pleurobrachia sp; a higher phytoplankton standing stock also resulted. Stirring to the bottom may develop equilibrium among components of the simple linear food web. Stirring resulted in net nutrient utilization ratios typical of the open sea, while in unstirred CEEs the N:P utilization ratio was high. Addition of 15 micrograms/l copper reduced copepod feeding rate but did not cause mass mortality. (Lynch-Wisconsin)
W79-03512

LOWER SANTEE RIVER ENVIRONMENTAL QUALITY STUDY; AN ASSESSMENT OF SELECTED BIOLOGICAL AND PHYSICAL PARAMETERS.
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 5B
W79-03513

CONTINUOUS SIMULATION OF NONPOINT POLLUTION,
Ramlit Associates, Berkeley, CA.
For primary bibliographic entry see Field 5B
W79-03515

BIOLOGICAL PROBLEMS WITH THE USE OF SEA WATER FOR COOLING,
Central Electric Generating Board, Fawley (England). Fawley Power Station.
T. Langford.
Chemistry and Industry, July 16, 1977, p 612-616, 20 ref.

Descriptors: *Water pollution effects, *Cooling water, *Sea water, *Intakes structures, Screens, Corrosion, Mortality, Fish, Invertebrates, Plankton, Heated water, Discharge(Water), Sites, Design.

Biological problems associated with the use of seawater for cooling are identified as being direct problems and environmental considerations. Direct problems are mainly intake-screen blockage, condenser-tube fouling and biologically induced corrosion. Environmental considerations include intake mortalities of fish and invertebrates, plankton mortalities incurred in transit through the cooling system, and possible effects of discharged heat, biocides, corrosion products or other chemicals on life in the receiving waters. Discussion of the problems and progress made in the past few years leads to the conclusion that by careful biological investigation early in the pre-siting and pre-design stages, many of the potential problems can be identified and steps taken to minimize their occurrence and effects. (Chilton-ORNL)
W79-03543

HISTOPATHOLOGICAL EFFECTS INDUCED IN MYTILUS EDULIS BY MYTILICOLA INTESTINALIS AND THE HISTOCHEMISTRY OF THE COPEPOD INTESTINAL CELLS,
Institute for Marine Environmental Research, Plymouth (England).
M. N. Moore, D. M. Lowe, and J. M. Gee
International Council for the Exploration of the Sea, Journal Du Conseil, Vol 38, No 1, 1978, p 6-11, 2 fig, 21 ref

Descriptors: Environmental effects, Parasitism, Temperature, *Mussels, *Pathology, Animal parasites, Histopathology, Cytological studies.

Epithelial cells lining the intestine and rectum of infected mussels exhibited metaplasia, the normal ciliated columnar cells being replaced by a non-ciliated cuboidal cell type. No significant differences were observed in numbers of macrophages in connective tissues of uninfected or infected mussels maintained at 10C after 12 or 81 days but both uninfected and infected animals maintained at 22C for 12 days showed significant increases in macrophages in connective tissues. After 81 days, no significant difference could be detected in numbers of macrophages between the four groups of mussels, indicating that the animals at the higher temperature had attained a steady state after the initial response. It was concluded that the parasite had no significant effect on the basic cellular functions of the mussel. (Chilton-ORNL)
W79-03544

PHYSIOLOGICAL RESPONSES OF MYTILUS EDULIS L. TO PARASITIC INFESTATION BY MYTILICOLA INTESTINALIS,
Institute for Marine Environmental Research, Plymouth (England)
B. L. Bayne, J. M. Gee, J. T. Davey, and C. Scullard
International Council for the Exploration of the Sea, Journal Du Conseil, Vol 38, No 1, 1978, p 12-17, 5 fig, 2 tab, 19 ref

Descriptors: Environmental effects, *Parasitism, Temperature, *Mussels, Metabolism, Growth rates, Respiration, Feeding rates, Animal parasites, Thermal stress

Physiological measurements were made on Mytilicola intestinalis infested mussels maintained at 10, 22, and 23C. Rates of oxygen consumption were significantly higher at 22 than at 10C with a mean temperature coefficient over all conditions of time and infestation level of 1.29 ... or 0.12. There was no significant overall effect of temperature on fil

tration rate. Rates of ammonia excretion were higher at 22 than at 10C did not acclimate over time. Only filtration rates were significantly affected by infestation level with filtration rate being depressed at increasing infestation levels. (Chilton-ORNL)
W79-03545

A BIOENERGETIC MODEL FOR THE ANALYSIS OF FEEDING AND SURVIVAL POTENTIAL OF WINTER FLOUNDER, PSEUDOPLEURONECTES AMERICANUS, LARVAE DURING THE PERIOD FROM HATCHING TO METAMORPHOSIS,
National Marine Fisheries Service, Narragansett, RI. Narragansett Lab.
G. C. Laurence
Fishery Bulletin, Vol. 75, No. 3, July 1977, p 529-546, 17 fig, 3 tab, 63 ref

Descriptors: Environmental effects, *Model studies, *Fish, *Larvae, *Larval growth stage, Growth rates, Feeding rates, Temperature, Metabolism, Food abundance, Prey, Mortality

The model examined in this study includes the forcing variables of temperature, prey density, and larval size or age and their effects on the ability of winter flounder larvae to successfully acquire energy rations necessary for experimentally determined growth and metabolic parameters. Prey density was found to be one of the most important factors affecting survival during the larval stage. Specific growth rates ranged from 5.72 to 8.70%/day at survival prey concentrations of 3.7 to 21.7 cal/liter. Critical prey densities below which larvae did not have sufficient time during the day to obtain adequate food for growth and metabolism varied with age and ranged from 2.1 to 5.7 cal/liter. These studies were conducted at a constant temperature of 8C. (Chilton-ORNL)
W79-03548

THERMAL SELECTION OF BULLFROG TADPOLES (RANA CATESBEIANA) AT DIFFERENT STAGES OF DEVELOPMENT AND ACCLIMATION TEMPERATURES,
Oklahoma Univ., Norman. Dept. of Zoology.
V. H. Hutchison, and J. G. Hill
Journal of Thermal Biology, Vol. 3, p 57-60, 1 fig, 1 tab, 20 ref, 1978

Descriptors: Environmental effects, *Thermal pollution, Temperature, Amphibians, *Frogs, Growth stages, Animal behavior, Preferred temperature, Acclimation temperature, Thermal selection, Thermoregulation

Preferred temperatures (PT) of bullfrog tadpoles were determined at developmental stages 25-26, 35-36, 39-40, 41, and 43-44 and at acclimation temperatures (AT) of 4.4, 15.5, 26.7, and 35C. At stage 25-26, high AT resulted in lower PT than was found in tadpoles acclimated at intermediate AT. Increased AT at stages 43-44 resulted in increased PT at all stages. PT distributions was bimodal at some combinations of stage and AT. Some combinations of early stage and low AT resulted in strongly truncated distributions of PT at the cold end of the gradient. The overall mean PT for all groups was 20.66C and the overall mode, 20.97C. The greatest variation among the different AT groups occurred in animals acclimated to 35C. Among the different developmental stages, the greatest variation was in stages 43-44. It was suggested that the plasticity of PT with changes in AT is one of the strategies which ectotherms employ to circumvent the deleterious consequences of rapid changes or thermokinetic extremes. (Chilton-ORNL)
W79-03549

THERMAL SENSITIVITIES OF MALATE DEHYDROGENASE ISOZYMES IN TYPHA,
South Carolina Univ., Columbia. Dept. of Biology.
E. H. Hu, R. R. Shantz, and M. H. Smith
American Journal of Botany, Vol. 65, No. 2, 1978, p 214-220, 4 fig, 3 tab, 22 ref. ERDA EY-76-C-09-0819

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, Aquatic plants, Enzymes, Temperature, Thermal stress, *Cattails

Of the cattails from the test area (an impoundment subjected to thermal stress from Savannah River Plant, South Carolina), Typha domingensis was found to be intolerant of the thermal stress in the hottest section of the pond and its entire complement of malate dehydrogenase (MDH), isozymes were denatured by heating at 50C. Typha latifolia was found to be tolerant to the thermal stresses in the hottest section and three of its MDH isozymes were unaffected by heating at 50C. It was suggested that natural selection might have led to these differences in thermal stability of the MDH isozymes. Both species are electrophoretically monomorphic and no variation in isozyme expression in ten enzyme systems was found in the test populations. (Chilton-ORNL)
W79-03550

TEMPERATURE ACCLIMATION AND OTHER INFLUENCES ON EMBRYONIC DURATION IN THE COPEPOD PSEUDOCALANUS SP.,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
R. C. Hart, and I. A. McLaren
Marine Biology, Vol. 45, No. 1, 1978, p 23-30, 4 fig, 2 tab, 17 ref

Descriptors: Environmental effects, *Temperature, *Copepods, Growth stages, *Embryos, *Growth rates, Size

Eggs of Pseudocalanus females captured at the end of winter developed more slowly than did those taken in summer and early autumn. Mean development times were clearly related to cephalothorax lengths of females. Investigations showed size-assortative mating and that the size of the male also influenced embryonic duration. After short-term acclimaton, embryos developed relatively more rapidly at low temperatures indicating a clockwise rotation of the rate-temperature response. Since larger females from a given season produce embroys showing this rotation of rate-temperature response, it was suggested that seasonal rotation may also be related to seasonal variatons in size. It was concluded that short-term temperature acclimation affects embryonic duration in Pseudocalanus slightly, and in the expected compensatory way, but that there is need for further investigation into some of the other relationships observed in this study. (Chilton-ORNL)
W79-03551

VARIATIONS IN THE SHALLOW WATER FORM OF POTAMOGETON RICHARDSONII INDUCED BY SOME ENVIRONMENTAL FACTORS,
Guelph Univ., (Ontario). Dept. of Botany and Genetics
D. H. N. Spence, and H. M. Dale
Freshwater Biology, Vol. 8, 1978, p 251-268, 9 fig, 9 tab

Descriptors: *Environmental effects, *Temperatures, *Light, Aquatic plants, Shallow water, *Plant morphology, *Radiation.

This paper assesses the differential effects of ontogeny, photosynthetically active radiation (PAR), and temperature on shoot growth of P. richardsonii along with overall effects of light and nutrients on biomass, and of shelter on leaf area index. The data suggest that light, temperature and ontogeny interact on vertical shoot extension so that maximal extension occurs on young shoots in very low irradiance at temperatures above 9C. Effects of increasing water temperature are depressed by increasing irradiances and ageing until minimal extension takes place in old shoots at mid- to late-summer temperature in high irradiances. Leaf length/breadth ratio was increased by low irradiance, significantly at 4% daylight, and by ontogenetic drift at high irradiances of shallow water. Length/breadth ratio was not correlated with substrate. (Chilton-ORNL)
W79-03554

MONTHLY OXYGEN AND CARBON BUDGETS OF THE NEW YORK BIGHT APEX,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 5B.
W79-03555

SURVIVAL AND VIABILITY OF ESCHERICHIA COLI IN A THERMALLY ALTERED RESERVOIR,
Savannah River Lab., Aiken, SC
R. W. Gorden, and C. B. Fliermans.
Water Research, Vol. 12, No. 5, 1978, pp 343-352, 5 fig, 4 tab, 29 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Bacteria, Mortality, Resistance, Growth rates, Nuclear reactors, Reservoirs, Thermal water, Bioindications, *E. coli.

The objectives of this study were to determine the ability of E. coli populations to survive and grow in a warm, monomictic reservoir receiving thermal effluent from a nuclear production reactor and to contribute to the evaluation of E. coli as an indicator of fecal contamination. Known populations of the bacteria were suspended in sterile chambers at various depths. Under temperature conditions of the reactor not operating (RNO) and reactor operating (RO), the E. coli survived and grew at each depth and at all stations. Under RO conditions, the populations reached higher optical densities and maintained those densities for longer time periods than under RNO conditions. Differences between population survival and growth during thermal alterations suggest that care must be taken when E. coli is regarded as an indicator of recent fecal contamination in warm aquatic ecosystems. (Chilton-ORNL)
W79-03556

UPPER TEMPERATURE TOLERANCES OF TELLINA TENUIS AND T. FABULA,
Glasgow Univ. (Scotland). Dept. of Zoology.
J. G. Wilson
Marine Biology, Vol. 45, No. 2, 1978, p 123-128, 2 fig, 4 tab, 30 ref.

Descriptors: *Environmental effects, *Temperature, *Mollusks, Resistance, Mortality, Distribution patterns, Littoral, Shallow water, Interitidal areas

Short- and long-term mortalities of molluscs (T. tenuis and T. fabula) were investigated in animals exposed to a variety of temperature regimes. Short-term tolerance tests showed the LD50 to be 31.50C for T. tenuis and 26.5C for T. fabula. Long-term tests also showed T. tenuis to be more tolerant at both high high and low extremes of temperature with a consistent difference in tolerance of about 5C. Both species adapted to higher temperatures after steady temperature acclimation but not to gradually increasing temperature. Even though T. tenuis showed greater thermal tolerance, both species have the same geographical range. The thermal tolerance is reflected in their respective littoral and sublittoral distributions with T. tenuis being found on the shore and T. fabula being confined to below low water. (Chilton-ORNL)
W79-03557

CARBONIC ANHYDRASE (ACETAZOLAMIDE-SENSITIVE ESTERASE) ACTIVITY IN THE BLOOD, GILL AND KIDNEY OF THERMALLY ACCLIMATED RAINBOW TROUT, SALMO GAIRDNERI.
Brock Univ., St. Catharines (Ontario). Dept. of Biological Sciences.
A. H. Houston, and L. S. McCarty
Journal of Experimental Biology, Vol. 73, 1978, p 15-27, 1 fig, 2 tab, 50 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Trout, *Rainbow trout, Fish, Animal physiology, Enzymes, Compensation

At acclimation temperatures of 2, 10, and 18 carbonic anhydrase activity as well as plas

levels of sodium, potassium and chloride were investigated in rainbow trout. Sodium and chloride concentrations and the sodium: chloride ratio did not vary significantly. Potassium levels were significantly higher at 18C. Acclimation to higher temperatures resulted in elevation of blood carbonic anhydrase activity. Under physiologically realistic incubation temperature conditions, changes were observed in renal and branchial carbonic anhydrase cativity which were modest but significant. It was concluded that branchial and renal carbonic anhydrase activities may provide relatively thermostable basal rates of sodium and chloride uptake. Augmentation of recruitment at temperatures which promote increased electrolyte depletion appears to be largely associated with increased branchial (Na+/K+) ATPase and erythrocyte carbonic anhydrase activities. (Chilton-ORNL)
W79-03559

RETARDATION OF SEDIMENT PHOSPHORUS RELEASE BY FLY ASH APPLICATION,
Notre Dame Univ., IN.
T. L. Theis, and P. J. McCabe.
Journal Water Pollution Control Federation, Vol. 50, No. 12, December 1978, p. 2666-2676, 8 fig, 4 tab, 21 ref. EPA R801245.

Descriptors: Environmental effects, *Water pollution effects, Sediments, *Phosphorus, Fly ash, Lakes, Eutrophication.

This study reports on the effects of the placement of a layer of fly ash on the sediments of a small, culturally eutrophic lake. The application brought about a reduced release of phosphorus during anoxic periods due to both physical and chemical alterations in the sediments. A sharp decrease in sediment moisture content was noted in comparison to control sediments. CDB (citrate-dithionite-bicarbonate extractable) iron and phosphorus values were reduced by an average of 37 and 44% respectively. Previous criteria for selection of fly ash for application to lake sediments have been identified as lime content and comparative specific gravity relative to the sediments to be treated. It is suggested that the CDB iron and phosphorus contents and potential for heavy metal release to the sediment environment be added to the criteria. (Chilton-ORNL)
W79-03560

ASPECTS OF ESTUARINE INTERTIDAL ECOLOGY OF JUVENILE STRIPED MULLET, MUGIL CEPHALUS, IN HAWAII,
California Univ., Santa Cruz. Center for Coastal Marine Studies.
P. F. Major.
Fishery Bulletin, Vol. 76, No. 2, 1978, p. 299-314, 3 fig, 3 tab, ref.

Descriptors: *Environmental effects, *Temperature, Salinity, Fish, Distribution patterns, *Mullet, Estuaries, *Estuarine environment, Intertidal areas, Predation, Schools(Fish), *Hawaii.

An experimental vertical thermal gradient was used to study the relationship between salinity and temperature and the distribution of schools of young striped mullet. Field observations were made of the distribution, feeding, and predator-prey behavior of schooled mullet. Depth and temperature distribution results taken together indicated that temperature selection was the more important factor in distribution. Fish < or = 50 mm standard length (SL) showed a predilection towards the surface whereas fish > or = 50 mm SL appeared predisposed towards the bottom before the initiation of heating or cooling. In the field, fish > or = 50 mm remained seaward of the tide of heating or cooling. In the field, fish > or = 50 mm remained seaward of the tide line in water of lower and more uniform temperature and higher and more uniform salinity than those recorded for mullet < 50 mm. The formation of large schools during all stages of life appears to be important in reducing predation and possibly also in competing with other species for food and space in estuarine intertidal region. (Chilton-ORNL)
W79-03561

CHANGES IN MUSCLE PHOSPHOFRUCTOKINASE IN TEMPERATURE ACCLIMATED WINTER FLOUNDER (PSEUDOPLEURONECTUS AMERICANUS),
Memorial Univ. of Newfoundland, St. John's. Dept. of Biochemistry.
L. L. Longerich, and L. A. W. Feltham.
Journal of Thermal Biology, Vol. 3, 1978, p. 61-67, 7 fig, 2 tab, 33 ref.

Descriptors: Environmental effects, *Water pollution effects, Thermal pollution, *Flounder, *Temperature, Fish, Enzymes.

Flounder white muscle tissue was assayed to determine if temperature compensation could be demonstrated in these fish through a change in the activity of the allosteric enzyme phosphofructokinase (PFK) and whether this compensation was due to quantitative or qualitative changes in the enzyme. Flounder muscle PFK specific activity increased with increasing amounts of fructose-6-phosphate(F-6-P). Affinity for F-6-P was the same for fish acclimated to both OC and 15C as shown by similar S50 values. There was no evidence that PFK from the two sets of acclimated fish behave differently to any of the effectors test, however, the specific activity of muscle homogenate PFK from OC acclimated flounder was significantly higher than that of the 15C acclimated flounder. The evidence suggested that this difference is due to a quantitative change in the amount of enzyme produced in the winter flounder under different environmental temperatures. (Chilton-ORNL)
W79-03563

WORKSHOP ON COPPER IN ESTUARINE, CONTINENTAL AND MARINE WATERS.
Department of Energy, Washington, DC. Div of Biomedical and Environmental Research.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-771236, Price codes: A03 in paper copy, A01 in microfiche. CONF-771236, UC-11, April 1978. Summary of a Workshop held in San Francisco, California, December 7-8, 1977, Templeton, W.L. (Ed.) 36 p.

Descriptors: *Conferences, Publication, Technical societies, *Copper, *Estuarine environment, Ecosystems, Freshwater, Sea water.

This report is the summary of a workshop held in conjunction with the Fall Meeting of the American Geophysical Union as an adjunct to the AGU sessions on Copper in Estuarine, Continental and Marine Waters. The intention of the workshop was to provide a basis for discussion and interaction by scientists. Short summaries of the four major topic areas (Analytical and Sampling Techniques, Copper/Ecosystems Interactions, Biological Availability, and Biological Uptake and Effects) which were prepared by the discussion leaders are printed in this report. Abstracts of papers presented at AGU session on Copper in Estuarine, Continental and Marine Waters are included in the report. (Chilton-ORNL)
W79-03564

PHOSPHATE INCORPORATION BY DAPHNIDS AND CHANNEL CATFISH IN PHOSPHATE-RICH ENVIRONMENTS,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
J. R. Strange, W. E. Kerr, P. M. Allred, and D. J. Fletcher.
Journal of Environmental Science and Health, Vol. 12, No. 7, p 311-325, 1977. 1 fig, 3 tab, 6 ref. OWRT B-088-GA (3).

Descriptors: *Water pollution effects, *Phosphates, *Food chains, *Catfishes, *Daphnia, Radioactive wastes, Laboratory tests, Plankton, Chemical analysis, Path of pollutants, Food webs, Ecosystems, Water pollution, Phosphorus compounds.

Studies undertaken to determine the extent to which Daphnia incorporated phosphate and the extent of the bioconcentration and bioaccumulation of phosphate in channel catfish are reported. Three different laboratory experiments were conducted for the studies: (1) Daphnia were examined for phosphorus uptake after radiolabelled and unlabelled phosphate were introduced into the water; (2) catfish uptake was examined after the injection of radiolabelled and unlabelled phosphate into the water; (3)catfish were fed Daphnia which had incorporated phosphate, and then examined for bioaccumulation of phosphorus. The Daphnids maintained a steady level of radioactive phosphate after the slight decline in measured radioactivity. The catfish directly exposed to the radiolabelled phosphate for two weeks incorporated labelled phosphate in detectable amounts in all tissues examined. Bioconcentration was found in the heart, brain, liver, and bone; while gill, stomach, and kidney activities remained constant. Bioaccumulation studies of the phosphate incorporated Daphnis fed catfish showed bioaccumulation in the bone, gill, brain and kidney. It is concluded that Daphnia and channel catfish directly incorporate inorganic phosphate in environments with a high phosphate content. (Davison-IPA)
W79-03585

SURVEY OF BENTHIC CORAL REEF ECOSYSTEMS, FISH POPULATIONS, AND MICROMOLLUSKS IN THE VICINITY OF THE WAI'ANAE SEWAGE OCEAN OUTFALL, O'AHU, HAWAII -- SUMMER 1975,
Hawaii Univ., Honolulu. Water Resources Center.
For primary bibliographic entry see Field 5E.
W79-03591

THE EFFECT OF WASTEWATER TREATMENT ON METHANOGENESIS IN A MARINE OUTFALL,
California Univ., Los Angeles.
A. L. Warford, and D. R. Kosiur.
Journal of the Water Pollution Control Federation, Vol. 51, p 37-42, 1979. 3 fig, 2 tab, 22 ref.

Descriptors: *Methane, *Methane bacteria, *Sewage treatment, Outlets, *Outfall sewers, Waste water treatment, Sulfates, Sulfides, Organic matter, Water analysis, Chemical analysis, Sediments, Bacteria, Carbon cycle, *Methanogenesis.

Methanogenesis in the Avalon outfall sediments of Santa Catalina Island, California, was monitored in its natural environment before and after the initiation of wastewater treatment. After treatment began, the outfall sediments were less reducing and contained less organic matter, which led to a thirty fold reduction in the rate of methane production. High concentrations of sulfide and the presence of active sulfate-reduction did not inhibit methanogenesis, contrary to the observations in lacustrine sediments. Methanogenesis was observed to recycle annually 0.13% of the organic carbon. (EIS-Deal)
W79-03636

MORTALITY PATTERNS IN TROUT (SALMO TRUTTA AND S. GAIRDNERI) EXPOSED TO AN ANIONIC DETERGENT IN RELATION TO CONCENTRATION AND MECHANISMS OF TOXIC ACTION,
Sunderland Polytechnic (England). Dept. of Biology
P. D. Abel.
Freshwater Biology, Vol. 8, p 497-503, 1978. 4 fig, 2 tab, 10 ref

Descriptors: *Mortality, *Detergents, *Rainbow trout, *Brown trout, Toxicity, Bioassay, Path of pollutants, Organic compounds, Sulfates, Chemical analysis, Statistical methods, Fish physiology, Animal metabolism, Electron, Microscopy, Cytological studies, *Sodium lauryl sulphate, Anionic detergent, *Tissue analysis, *Histology, *Probit lines, Mortality patterns

Histological and electron microscopical study of the gills of fish poisoned by the anionic detergent sodium lauryl sulphate indicates that the nature of the toxic action changes at a concentration of about 120 mg l-1. Toxicity tests were conducted to determine whether this change could be detected

in the test data, using brown trout (Salmo trutta) and rainbow trout (S. gairdneri). Toxicity curves showed no indicaton of the change in toxic action, but at concentrations of 120 and 130 mg l-1 of sodium lauryl sulphate 'split' probit lines occurred, and the lines for 150 mg l-1 consistently differed in slope from other lines. (EIS-Deal)
W79-03637

DYNAMIC MODEL OF NUTRIFICATION IN HUNTINGTON BAY, NEW YORK,
Long Island Univ., Greenvale, NY. Dept. of Marine and Environmental Science.
For primary bibliographic entry see Field 5B.
W79-03638

THE EFFECTS OF MOTORWAY CONSTRUCTION ON AN URBAN STREAM,
Polytechnic of Central London (England).
C. A. Extence.
Environmental Pollution, Vol. 17, p 245-252, 1978. 2 tab, 11 ref.

Descriptors: *Road construction, *Sediment control, *Streams, Sediments, Water analysis, Suspended solids, Sediment transport, Biological communities, Invertebrates, Diptera, Aquatic populations, Mollusks, Worms, Construction, Erosion control, Roads.

The physical, chemical and biological impact of discharges resulting from motorway construction is assessed in an urban stream. The direct response of different organisms to such inputs is discussed and other effects that may be associated with this type of pollution are considered. It is concluded that discharges resulting from road construction can be serious enough to warrant control measures being implemented. (EIS-Deal)
W79-03639

CADMIUM AND ZINC IN MUSCLE OF BLUEGILL (LEPOMIS MACROCHIRUS) AND LARGEMOUTH BASS (MICROPTERUS SALMOIDES) FROM AN INDUSTRIALLY CONTAMINATED LAKE,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5A.
W79-03640

POLLUTION PROFILE OF A RIVER,
Bhabha Atomic Research Centre, Bombay (India) Health Physics Div.
For primary bibliographic entry see Field 5B.
W79-03641

SURVIVAL, DURATION OF LARVAL STAGES, AND SIZE OF POST-LARVAE OF GRASS SHRIMP, PALAEMONETES PUGIO, REARED FROM KEPONE CONTAMINATED AND UNCONTAMINATED POPULATIONS IN CHESAPEAKE BAY,
Old Dominion Univ., Norfolk, VA. Inst. of Oceanography
A. J. Provenzano, Jr. K. B. Schmitz, and M. A. Boston.
Estuaries, Vol. 1, No. 4, p. 239-244, 1978. 1 fig., 3 tab., 12 ref.

Descriptors: *Shrimp, *Toxicity, Larval growth stage, Chemical wastes, Industrial wastes, Reproduction, Chlorinated hydrocarbon pesticides, Water chemistry, Growth stages, Water temperature, Salinity, *Chesapeake Bay, Bioassay, *Kepone, Tissue analysis, Survival, *Palaemonetes.

Female grass shrimp and eggs from the James River had highest concentrations of Kepone (0.63 and 0.47 ppm, respectively) with sample from the Lafayette River at the mouth of the James River having the second highest levels (0.04 and 0.4 ppm). Concentrations in ovigerous females and eggs in the populations most distant from the James (mouth of Potomac and upper Potomac River) were at or below the limits of detectability (0.001 to 0.015 ppm). In laboratory reared postlarvae from each site, concentrations of Kepone were undetectable. Despite these apparent differences in Kepone concentrations in the various populations were found no significant difference in larval, larval duration, or length of post-larvae attributable to site of origin. Highly significant differences in larval duration and size of post-larvae were attributable to parental variation. (EIS-Deal)
W79-03642

MERCURY BIOCONCENTRATION IN FISH: TEMPERATURE AND CONCENTRATION EFFECTS,
Northwestern Univ., Evanston, IL. Dept. of Environmental Health Engineering.
For primary bibliographic entry see Field 5B.
W79-03643

EFFECTS OF THE INSECT GRWOTH REGULATOR DIMILIN (TH 6040) ON LARVAL DEVELOPMENT OF TWO ESTUARINE CRABS,
Oslo Univ. (Norway). Zoological Museum
M. E. Christiansen, J. D. Costlow, Jr, and R. J Monroe.
Marine Biology, Vol. 50, p. 29-36, 1978. 7 fig., 8 tab., 17 ref

Descriptors: *Crabs, *Animal pathology, *Pesticide toxicity, Insect control, Toxicity, Animal physiology, Animal metabolism, Mortality, Growth stages, Larval growth stage, Insecticides, Pesticide kinetics, *Dimilin, *Survival, *Zoeae, *Histology, *Tissue analysis

Effects of Dimilin, and ilnsect growth regulator which interferes with the formation of the insect cuticle, were studies on the larval development of Rhithropanopeus harrisii and Sesarma reticulatum (Crustacea: Brachyura). When larvae were exposed to 0.5 (R. harrisii only), 1,3,5,7, and 10 ppb Dimilin from hatching to the first crab stage, survival in both sepecies decreased in relation to increased concentrations of Dimilin. Survival of R. harrisii larvae was significantly lower at 1 ppb and higher levels compared with control experiments, and in S. reticulatum a significant decrease in survival began at the 3 ppb level. At 10 ppb Dimilin, lno larvae survived to the megalopa stage in either of the two specis. When R. harrisii larvae were treated with 10 ppb Dimilin during the intermolt period of each of the 4 zoeal stages, nearly all larvae died during molting to the succeeding stage. First zoeal larvae of R. harrisii exposed to 10 ppb Dimilin at various days during the intermolt period were more sensitive to the compound late than early in the period. It is suggested that Dimilin also may interfere with the formation of the cuticle in crab larvae. (EIS-Deal)
W79-03644

COMPARATIVE GROWTH, RESPIRATION AND DELAYED FEEDING ABILITIES OF LARVAL COD (GADUS MORHUA) AND HADDOCK (MELANO-GRAMMUS AEGLEFINUS) AS INFLUENCED BY TEMPERATURE DURING LABORATORY STUDIES,
National Marine Fisheries Service, Narragansett, RI. Narragansett Lab
G. C. Laurence
Marine Biology, Vol. 50, p 1-7, 1978. 4 fig, 2 tab, 29 ref.

Descriptors: *Water temperature, *Fish physiology, Fish reproduction, Fish behavior, Respiration, Growth rates, Feeding rates, Food habits, Larval growth stages, Fry, Mortality, Inhibition, Animal metabolism, Embryonic growth stage, *Cod, *Haddock.

Comparative growth and respiration were measured during the period hatching to metamorphosis for larval cod at 4, 7 and 10C and for haddock at 4, 7 and 9C. Growth was positively correlated with temperature for both species. Specific growth rates on a daily basis indicated good growth for the two species at the upper two temperatures and suppressed growth at 4C. Respiraton rates measured by oxygen consumption were similar for both species. Variable and elevated oxygen consumption at 4C indicated physiological stress at that temperature. Delayed feeding abilities, feeding initiation, yolk absorption and morphological development related to first feeding ability were similar for both species at 7 and 10C. Larvae could survive without food and still initiate feeding until 10 days after hatching at 7C and until 8 days at 9 to 10C. (EIS-Deal)
W79-03645

VASCULAR EFFECTS OF ACETYLCHOLINE, CATECHOLAMINES AND DETERGENTS ON ISOLATED PERFUSED GILLS OF PINK SALMON, ONCORHYNCHUS GORBUSCHA, COHO SALMON, O. KISUTCH AND CHUM SALMON, O. KETA,
Messina Univ. (Italy). Inst. of General Physiology.
L. Bolis, and J. C. Rankin
Journal of fish Biology, Vol. 13, p 543-547, 1978. 4 fig, 14 ref.

Descriptors: *Fish physiology, *Pink salmon, *Sockeye salmon, *Chum salmon, *Detergents, Salmon, Chemical properties, Chemical analysis, Linear Alkylate sulfonates, Toxicity, Spawning, Animal metabolism, Inhibition, *Acetylcholine, *Adrenaline, *Isoprenaline, *Vascular system, *Tissue analysis, *Propanolol, *Gills.

Acetylcholine caused vasoconstriction whilst adrenaline and isoprenaline caused vasodilation in isolated perfused Pacific salmon gills. The detergent LAS produced concentration dependent vasodilation when present in the perfusate in concentrations of 0.6 to 3 mg l-1. The effect of LAS was partly blocked by propranalol suggesting the involvement of B-Adrenergic receptors. The maximum responses obtained with acetylcholine, adrenaline or LAS were all much greater in sea water or pre-spawning freshwater fish than in spawning fish. (EIS-Deal)
W79-03646

ACCUMULATION OF THE ORGANOPHOSPHATE BLACKFLY LARVICIDE ABATE (TEMEPHOS) IN SAROTHERODON MOSSAMBICUS, WITH REFERENCE TO THE LARVICIDAL CONTROL OF SIMULIUM DAMNOSUM
Centre for Overseas Pest Research, London (England)
P. Matthiessen, and J. S. Johnson.
Journal of Fish Biology, Vol. 13, p 575-586, 1978. 2 fig, 3 tab, 28 ref

Descriptors: *Larvicides, *Organophosphorus pesticides, *Pesticide residues, Pesticide kinetics, Absorption, Diptera, Fish physiology, Animal metabolism, Biodegradation, Water chemistry, Path of pollutants, Fish food Organisms, Toxicity, Animal parasites, Human pathology, Public health, Insecticides, Tissue analysis, Bioaccumulation, *Temephos, *Abate, *Sarotherodon.

This paper describes the uptake and fate of the organophosphate larvicide Abate (temephos) in the tropical food fish, Sarotherodon mossambicus during exposure to concentrations (nominally 0.001-0.1 mg dm-3) similar to those being produced in West African rivers by the WHO Onchocerciasis Control Programme. S. mossambicus was able to absorb Abate both directly from the surrounding water, and by contaminated food. Maximum residue concentrations were proportional to dosage and were elevated in starving fish. Internal distribution depended on tissue fat content. Some fish produced the sulphoxide metabolite, and total residues diminished slowly during recovery. (EIS-Deal)
W79-03647

THE EFFECT OF COPPER, HARDNESS AND PH ON THE GROWTH OF RAINBOW TROUT SALMO GAIRDNERI.
Guelph Univ. (Ontario). Dept. of Zoology
K. G. Wakwood, and F. W. H. Beamish
Journal of Fish Biology, Vol. 13, p 591-598, 1978. 2 fig, 2 tab, 23 ref

Descriptors: *Copper, *Hardness(Water), *Hydrogen ion concentration, *Growth rates, *Rainbow trout, Fish physiology, Animal metabolism, Fish diets, Fish behavior, Inhibition, Toxicity, Copper compounds, Regression analysis, Metals, Water chemistry, Chemical analysis, Cupric ions.

Rainbow trout held at a fixed ration and activity regime were exposed to a number of copper, pH and hardness combinations. Growth rate, appetite and gross conversion efficiency were determined over three consecutive 10-day periods and partial or complete recovery was observed thereafter. For a given pH, less copper was required to reduce growth by a given amount at low than at high levels of hardness. At a given hardness, copper-induced depressions in growth rate were more pronounced and recovery slower in a low than in a high pH. No distinction could be made among total soluble or extractable copper but predicted concentrations of six specific cupric ions varied with pH and hardness. Regression analysis indicates that only $Cu2+$ and $CuOH+$ could be significantly correlated with growth rate. (EIS-Deal)
W79-03648

POLYCHLORINATED BIPHENYL (PCB) EFFECTS ON MARINE PHYTOPLANKTON PHOTOSYNTHESIS AND CELL DIVISION,

Stanford Univ., Pacific Grove, CA. Hopkins Marine Station.
L. W. Harding, Jr, and J. H. Phillips, Jr.
Marine Biology, Vol. 49, p 93-101, 1978. 3 fig, 2 tab, 50 ref.

Descriptors: *Polychlorinated biphenyls, *Toxicity, *Photosynthesis, *Phytoplankton, Marine algae, Cytological studies, Reproducton, Inhibition, Diatoms, Growth rates, Primary productivity, Aquatic populations, Chemical wastes, Chlorophyta, Water pollution effects, *Thalassiosira, Isochrysis, *Chaetoceros, *Skeletonema.

Inhibition of photosynthesis and cell division by polychlorinated biphenyls (PCBs) was studied using 7 marine phytoplankton species representing 4 algal classes. PCB concentrations as low as 1.0 microg l-1 reduced cell division of Thalassiosira pseudonana 3H and Isochrysis galbana. Both photosynthesis and cell division of T. pseudonana 3H, Chaetoceros socialis, Skeletonema costatum, T. pseudonana 13-1, Monochrysis lutheri and I. galbana were inhibited at a PCB concentration of 10.0 microg l-1. The effects on photosynthesis were immediate and probably resulted in reduced rates of cell division. Interspecific differences in susceptibility were observed. These differences have significance with respect to primary production and the species composition of phytoplankton communities. The initial slopes of photosynthesis-irradiance curves for the diatoms S. costatum and T. pseudonana 3H were reduced in the presence of PCBs. These results suggest that PCBs affect the photosynthetic light reactions. (EIS-Deal)
W79-03650

REGULATION OF COPPER AVAILABILITY AND PHYTOPLANKTON BY MACROMOLECULES IN LAKE WATER,

Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinilgung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W79-03651

ROUTINE OXYGEN CONSUMPTION OF MUGIL CEPHALUS, LIZA DUMERILI AND L. RICHARDSONI AT DIFFERENT TEMPERATURES AND SALINITIES,

Port Elizabeth Univ. (South Africa). Dept. of Zoology.
F. K. Marais.
Marine Biology, Vol. 50, p 9-16, 1978. 7 fig, 2 tab, 1 ref.

Descriptors: *Oxygen, *Water temperature, *Salinity, *Mullets, Fish physiology, Animal metabolism, Fish behavior, Respiration, Diurnal, Fish populations, Biochemical oxygen demand, *Oxygen requirements, Starvation, Mugil, Liza.

Oxygen consumption studies were undertaken with 3 mullet species. It was found that handling had a profound influence on metabolic rate and led to considerably increased consumption rates during the first 8 h after introduction into the respiration chambers. Fasting in L. dumerili resulted in a total drop of 27% in oxygen consumption over a period of 6 days, of which 10% occurred over the first 24 h. Oxygen consumption displayed diurnal rhythms during the 6 day period, with lowest consumption rates at midday and midnight and highest just after sunrise and sunset. Patterns of oxygen consumption at different temperatures and salinity varied interspecifically. (EIS-Deal)
W79-03652

DISAPPEARANCE OF AROMATIC HYDROCARBONS AND ORGANIC SULFUR COMPOUNDS FROM FISH FLESH REARED IN CRUDE OIL SUSPENSION,

Okayama Univ. (Japan). Dept. of Public Health.
M. Ogata, and Y. Miyake.
Water Research, Vol. 12, p 1041-1044, 1978. 3 fig, 1 tab, 10 ref.

Descriptors: *Eels, Oil, *Oil pollution, Absorption, Aromatic compounds, Organic compounds, Sulfur compounds, Animal metabolism, Fish physiology, Sea water, Gas chromatography, Chemical analysis, *Crude oil, Tissue analysis, Bioaccumulation, *Depuration, *Benzene, *Toluene, *Xylene.

Eels (Anguilla japonica) were reared in sea water containing a crude oil suspension (50 ppm for 10 days for aromatic hydrocarbons, 2500 ppm for 3 days for organic sulfur compounds), then transferred to clean sea water. The disappearance of aromatic hydrocarbons and organic sulfur compounds from eel flesh was examined. Concentration ratio (concentration of eel flesh/concentration of water) of benzene, toluene, m- or p-xylene and o-xylene on 10 days is 3.5, 13.2, 23.6 and 21.4 respectively. Benzene, toluene, m-or p-xylene and o-xylene disappeared after the transfer to clean sea water, and half life period is 0.5, 1.4, 2.6 and 2.0 days respectively in first phase which lasted 0-5 days. Organic sulfur compounds in eel flesh decreased as the time spent in clean sea water increased, but were still present after 30 days. The results suggest that aromatic hydrocarbons and organic sulfur compounds could serve as markers of oil pollution in fish. (EIS-Deal)
W79-03654

THE SELECTION AND LIMITATIONS OF PHENOL AS A REFERENCE TOXICANT TO DETECT DIFFERENCES IN SENSITIVITY AMONG GROUPS OF RAINBOW TROUT (SALMO GAIRDNERI),

Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W79-03655

INFLUENCE OF THE POLYCHLORINATED BIPHENYL PREPARATION AROCLOR 1242 ON COLOR CHANGES OF THE FIDDLER CRAB UCA PUGILATOR,

Tulane Univ., New Orleans, LA. Dept. of Biology
S. W. Fingerman, and M. Fingerman.
Marine Biology, Vol. 50, p 37-45, 1978. 8 fig, 1 tab, 25 ref.

Descriptors: *Polychlorinated biphenyls, *Crabs, *Pesticide residues, *Aroclors, Chemical wastes, Pesticide kinetics Chlorinated hydrocarbon pesticides, Chemical analysis, Animal physiology, Path of pollutants, Animal metabolism, Cytological studies, Biochemistry, Pigments, *Tissue analysis, *Melanin, Fiddler crab, Uca

The melanin in the melanophores of specimens of the fiddler crab, Uca pugilator, exposed to 2, 4, and 8 ppm solutions of the polychlorinated biphenyl (PCB) preparation, Aroclor 1242R, became less dispersed than in untreated specimens. This effect was dose-dependent. It was probably due to the PCB itself and not to polychlorinated dibenzofurans which are contaminants of commercial PCBs. The decreased melanin dispersion appeared to be related to a decrease in the rate of release of melanin-dispersing hormone from eyestalk neutoendocrine cells into the hemolymph. Eyestalks of crabs kept for 4 days in Aroclor 1242 contained 4 times as much melanin-dispersing hormone as did control crabs. When injected into isolated legs, hemolymph from crabs exposed to Aroclor 1242 produced less melanin dispersion than did hemolymph from control crabs. Aroclor 1242 did not appear to have a direct effect on the pigment-dispersing mechanisms of the melanophores. (EIS-Deal)
W79-03656

CADMIUM UPTAKE BY RAINBOW TROUT, SALMO GAIRDNERI EGGS AND ALEVINS,

University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
J. H. Beattie, and D. Pascoe.
Journal of Fish Biology, Vol. 13, p 631-637, 1978. 4 tab, 21 ref.

Descriptors: *Rainbow trout, *Cadmium, *Fish eggs, *Fry, Biological membranes, Absorption, Adaptation, Fish behavior, Water chemistry, Chemical analysis, Toxicity, Heavy metals, Fish physiology, Animal metabolism, Fish diseases, Animal pathology, Bioaccumulation, Tissue analysis.

The uptake of cadmium by eggs and alevins of rainbow trout from water concentrations of between 0.01 and 50.0 mg Cd l-1 was investigated. The cadmium content of eggs and alevins increased with time and with exposure concentration. Lower cadmium levels were detected in alevins than in eggs. Most of the cadmium (98%) in the eggs was found to be associated with the egg membrane or chorion. This explains the considerable reduction in cadmium concentration observed in alevins after hatching. Alevins hatching from eggs which had been exposed to cadmium survived longer in cadmium than alevins not exposed as eggs. This suggests that the pretreatment of eggs with cadmium serves some protective function. Behavioural and pathological signs of cadmium poisoning such as erratic swimming and blood clotting in alevins were observed. (EIS-Deal)
W79-03657

ENHANCEMENT OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) BY LAKE FERTILIZATION IN GREAT CENTRAL LAKE: SUMMARY REPORT,

Fisheries and Marine Service, Nanaimo (British Columbia) Pacific Biological Station
R. J. LeBrasseur, C. D. McAllister, W. E. Barraclough, O. D. Kennedy, and J. Manzer
Journal of the Fisheries Research Board of Canada, Vol. 39, 1978. p 1580-1596. 10 tab, 6 fig, 66 ref

Descriptors: *Lakes, Phosphates, Nitrates, *Food chain, *Sockeye salmon, Zooplankton, *Eutrophication, Nutrients, Fertilizer, Fertilization, *Primary production, Fish food, Organisms, Fish harvest, Fish populations, Fish production, Canada, *Grand Central Lake(BC)

Great Central Lake was treated with ca. 100t of commercial grade fertilizer (ammonium nitrate and ammonium phosphate) annually from 1970 through 1971. Limnological parameters and sockeye salmon juveniles and adults were monitored from 1969 through 1976 to test the hypothesis that increasing the supply of inorganic nutrients in an ultraoligotrophic lake would increase production at succeeding trophic levels. During fertilized years mean summer primary production increased fivefold, zooplankton standing stock increased 9 times, the percentage survival from estimated potential egg deposition to juvenile sockeye increased 2.6 times, while mean stock size of adult sockeye increased from < 50,000 to > 360,000. Adult sockeye returning to an adjacent untreated lake also increased in abundance. The data for the 8 yr

period support the initial hypothesis, but the dominant processes affecting production and interrelationships between different trophic levels in different years remain masked. (EIS-Katz)
W79-03658

THE EFFECTS OF COAL ASH BASIN EFFLUENT AND THERMAL LOADING ON BACTERIAL POPULATIONS OF FLOWING STREAMS,
Texas Univ. Health Science Center, Houston. School of Public Health
R. K. Guthrie, D. S. Cherry, F. L. Singleton, and R. S. Harvey
Environmental Pollution, Vol. 17, p 297-302, 1978. 1 fig, 1 tab, 11 ref

Descriptors: *Bacteria, *Water temperature, *Thermal pollution, Aquatic populations, Growth rates, Water quality, Trace elements, *Thermal powerplants, Cytological studies, Biological communities, Coals, Seasonal, Water chemistry, Industrial wastes, *Coal ash

Water quality parameters and elemental concentrations were studied for a period of one year in an ash basin drainage systems. Measurements were made in streams heated by thermal discharge from an electric power plant and in a non-polluted reference stream. Water samples from four stations were cultured for total culturable heterotrophic bacteria in the water column, number of chromagenic colonies and total number of different colony types (diversity). Both thermal loading and large concentrations of chemical elements from the coal ash basin reduced diversity and percentage chromagens, although increasing total culturable bacteria. Temperature appeared to have a greater effect on community stability characteristics than did increased elemental concentration on the naturally-occurring bacterial populations in these systems. (EIS-Deal)
W79-03659

BENTHIC MACROINVERTEBRATE COMMUNITIES OF THE PENOBSCOT RIVER, MAINE, WITH SPECIAL REFERENCE TO THEIR ROLE AS WATER QUALITY INDICATORS,
Maine Univ. at Orono
For primary bibliographic entry see Field 5A.
W79-03669

THE EFFECTS OF SPARY IRRIGATION ON A MIXED FOREST ECOSYSTEM,
New Hampshire Univ., Durham. Dept. of Botany.
D. A. Weinstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 307, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, August 1976. 91 p, 15 fig, 15 tab, 52 ref. OWRT A-031-NH(4), 14-31-0001-3829.

Descriptors: Mixed forests, Ecology, Sewage effluents, *Sewage disposal, *Waste water disposal, Groundwater contamination, Phosphorus, Potassium, *New Hampshire, *Ecosystems, *Sunapee(NH), Mixed hardwood forest, Vegetative, Litter and soil components, Environmental measurements

A mixed hardwood forest at Sunapee, N.H. receiving applications of sewage effluent, was investigated for nutrient cycling characteristics in an attempt to determine the effect of the vegetation on renovation of wastewater. Biomass and nutrient pools were determined for all major vegetative, litter, and soil components in the sprayed forest and in a nearby control. Quantities and rates of transfer between these components were also determined. Both forests have high concentrations of nutrients in leaf tissue, yet low uptake amounts for all elements except P indicating that both were absorbing nutrients to their maximum capacity before spraying. No differences in concentration or productivity existed between the forests. As a result of spraying the forest composition is changing due to a high mortality of white pine. Alteration of normal litter dynamics did not inhibit removal of N, Ca, and Mg from the percolating water. Phosphorus and potassium, however, are leaching through to the lower soil layers in later summer, presenting a potentially dangerous threat of groundwater contamination.
W79-03679

THE LANDSAT LAKE EUTROPHICATION STUDY,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 7B.
W79-03682

BIOLOGICAL AND ECOLOGICAL STUDIES ON THE INTERACTION OF BDELLOVIBRIO AND ENTEROBACTERIACEAE,
Auburn Univ., AL
J. M. Westergaard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 670, Price codes: A13 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977, 269 p, 44 fig, 66 tab, bibliography, 4 append. OWRT B-061-ALA(2).

Descriptors: *Pathogenic bacteria, Sewage bacteria, Aquatic bacteria, Microorganisms, Sewage treatment, E. coli, *Bdellovibrio, Coliforms, Enteric bacteria

Water samples collected from wells, ponds, streams, wastewater oxidation lagoon systems and municipal wastewater treatment plants were examined for both Bdellovibrio and parameters important for the growth of Bdellovibrio. Municipal wastewater was the best source for isolation of Bdellovibrio; the organisms was not isolated from well water. Bdellovibrio strains isolated from different aquatic ecosystems, soil and fish had a common antigen as expressed by the Complement Fixation Test and Immunodiffusion Test. Eight locally isolated Bdellovibrio strains had a relatively wide host range. Wastewater and .22 u pore size wastewater filtrates inoculated with equal numbers of Escherichia coli and of Bdellovibrio cells were tested at regular intervals for Bdellovibrio and total coliform counts during a 9-day period. Bdellovibrio were not isolated from fecal specimens sampled from domestic animals. It was concluded that Bdellovibrio was not a normal inhabitant of the intestinal microflora of animals, and that the organism could be considered a harmless bacterium for poikilothermal and homeothermal animals.
W79-03691

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A
W79-03738

A GEOCHEMICAL STUDY OF A MARSH ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2K
W79-03743

SUMMARY OF AVAILABLE INFORMATION ON CHESAPEAKE BAY SUBMERGED VEGETATION,
Maryland Univ., Cambridge. Horn Point Environmental Lab.
For primary bibliographic entry see Field 2I
W79-03746

PRIMARY PRODUCTION IN THE FRESHWATER MARSH ECOSYSTEM OF TROY MEADOWS, NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ Dept. of Botany
For primary bibliographic entry see Field 2H
W79-03758

PRODUCTION, NUTRIENT CONTENT AN DECOMPOSITION OF PHRAGMITES COM MUNIS TRIN. AND TYPHA ANGUSTIFOLI L.,
University of East Anglia, Norwich (England School of Biological Sciences
For primary bibliographic entry see Field 2I.
W79-03759

ROLE OF INORGANIC CARBON AVAILABI ITY IN THE FORMATION OF NUISANC BLOOMS OF BLUE-GREEN ALGAE,
Oklahoma State Univ., Stillwater. Dept. of Bi logical Sciences.
J. D. Ownby.
Available from the National Technical Informati Service, Springfield, VA 22161 as PB-290 7 Price codes: A02 in paper copy, A01 in microfich Water Resources Research Inst. Oklahoma Sta Univ. Final Tech. Comp. Rpt 1978. 16 p, 6 fig, ref. OWRT A-077-OKLA(1), 14-34-0001-8038.

Descriptors: Carbonic anhydrase, Phytoplankto *Cyanophyta, *Eutrophication, *Carbon, *N sance algae, *Carbon dioxide, *Anabaena, *Sce edesmus, *Growth rates, Water pollution effec Bioassay, Radiometric assay, Pollutant identifi tion

Availability of inorganic carbon in the form CO2 has been suggested as a limiting factor in growth of phytoplankton under conditions of hi pH. The effects of pH and bicarbonate alkalin on growth of the blue-green alga Anabaena va bilis and the green alga Scenedesmus obliq were measured under laboratory conditions. though both organisms had an initial high gro rate, Anabaena exhibited longer sustained gro which was enhanced by high pH and high bic bonate alkalinity. These results appear consist with the hypothesis that blue-green algae are be able to compete for inorganic carbon under th conditions. In the presence of bicarbonate, growth of both algae caused an alkalinization the medium by 1.2 to 2.6 pH units, which attributed to the uptake of bicarbonate, its conv sion to CO2, and the subsequent release of OH i the growth medium. A radiometric assay was veloped to measure carbonic anhydrase activity phytoplankton. With this assay the possible role carbonic anhydrase in the enzymatic conversion bicarbonate to CO2 in algae can be studied
W79-03762

EFFECTS OF POLYCHLORINATED PHENYL COMPOUNDS AND PROPOS PCB-REPLACEMENT PRODUCTS EMBRYO-LARVAL STAGES OF FISH A AMPHIBIANS,
Kentucky Water Resources Research Inst., L ington.
W. J. Birge, J. A. Black, and A. G. Westerman
Available from the National Technical Informat Service, Springfield, VA 22161 as PB-290 Price codes: A03 in paper copy, A01 in microfi Research Report No. 118, 1978. 39 p, 2 fig, 12 27 ref. OWRT A-067-KY(1), 14-34-0001-7037, 34-0001-7038, 14-34-0001-8019.

Descriptors: *Polychlorinated biphenyls, * assay, Embryonic growth stage, Larvae, Aroc Rainbow trout, Channel catfish, Goldfish, fishes, Frogs, Toads, Bass, Dioctylphthalate, sononylphthalate, Polydimethylsiloxanes, Ter genesis

Static renewal bioassays were performed with polychlorinated biphenyls including Capacito and Aroclors 1016, 1242, and 1254. Each c pound was used to treat embryo-larval stage the rainbow trout (Salmo gairdneri), channel fish (Ictalurus punctatus), goldfish (Carassius tus), redear sunfish (Lepomis microlophus), l ard frog (Rana pipiens), Fowler's toad (Bufo leri), and American toad (Bufo americanus) velopmental stages of the trout were the sensitive, with LC50's at 4 days posthatchin 0.3, 1.0, 4.1, and 1.6 micro g l for Aroclors 1242, 1016, and Capacitor 21, respectively. ranged between 0.009-0.011 micro g l. Fow

oad was the most tolerant species, and LC50's aried from 3.7-28.0 micro g/l. Toxicity of the CB's generally increased with percent chlorine ubstitution. Bioassays also were conducted with ioctylphthalate (DOP), diisonoylphthalate, and ow Corning 561 silicone, three products proosed as replacements for PCB's. Embryos and rvae of the channel catfish, redear sunfish, leopard frog, and Fowler's toad were exposed rough 4 days posthatching. Catfish was the most ensitive species, and sunfish was the most resisnt. Based on LC50 values, replacement products ere found to be 2-5 orders of magnitude less toxic an PCB's. Continuous flow embryo-larval bioassays were performed on Capacitor 21 and DOP. est species included redear sunfish, rainbow out, and largemouth bass (Micropterus salmoides). Paralleling results from statis renewal sts, flow-through data reflected a vast difference toxicity between PCB's and potential replaceents. (Huffsey-Kentucky)
V79-03763

FFECTS OF SPARY IRRIGATION OF MUICIPAL WASTEWATER ON THE PHYSICAL ROPERTIES OF THE SOIL,
ennsylvania State Univ., University Park. School f Forest Resources.
. E. Sopper, and J. L. Richenderfer.
vailable from the National Technical Information ervice, Springfield, VA 22161 as PB-290 732, rice codes: A09 in paper copy, A01 in microfiche. st for Research on Land and Water Resources, inal Tech. Report Dec. 1978. 188 p, 12 fig, 64 tab, 6 ref, append. OWRT C-5169(No 4205)(2), 14-31-001-4205.

escriptors: *Sewage effluents, *Irrigation, *Mucipal wastes, Bulk density, Corn(Field), Red pine ees, Soils, *Pennsylvania, Physical properties, Spray irrigation, *Municipal wastewater, Forest oor, Accumulation of forest floor, Forest floor ecomposition, Moisture conditions, Temperature onditions, Infiltration capacity, Capillary porosy, Mixed hardwood, Reed canarygrass, Percolaon capacity, Root masses.

ffects of spray irrigation of treated municipal wage effluent on the forest floor and physical roperties of the soil were studied. Conducted on veral agronomic and forested areas in Central ennsylvania which had been irrigated with wage effluent for 14 years, the study included vo phases. Phase I investigated the effects of ray irrigation of treated municipal wastewater on e accumulation and decomposition of the forest oor. Phase II studied effects of spray irrigation of eated municipal wastewater on the physical propties of soil. Results indicated that spray irrigation wastewater increased the decomposition rates d decreased the accumulation of the forest floor. he increased decomposition rates of the forest oor were caused by increased moisture and temrature conditions at the forest floor-mineral soil terface and narrower C/N ratio of the litter. ray irrigation of wastewater also resulted in creased infiltration capacities of the Hublersburg t loam soil in the mixed hardwood and red pine rested areas and the reed canarygrass agronomic ea. No effect occurred on total or capillary posity; however, non-capillary porosity was lower the mixed hardwood, red pine, reed canarygrass, d corn areas. Spray irrigation of wastewater had effect on percolation capacity or bulk density. nk-Penn State)
79-03766

FLUENCE OF BLUE-GREEN ALGAE ON IE PH AND BUFFER CAPACITY OF CULRE MEDIA,
wa State Univ., Ames. Dept. of Botany and nt Pathology.
B. Wildman, B. L. Benner, D. D. Held, and C. Schauberger.
oceeding Iowa Academy Science Vol 81 No 4 p 2-196, 1974. 7 fig, 33 ref. OWRT B-039-IA(3), B-3-IA(2).

escriptors: Buffer capacity, Algae, Anabaena cyJrica, Anacystis nidulans, Nostoc muscorum, *Cyanophyta, Hydrogen ion concentration, Cultures.

Three strains of the blue-green algae Anabaena cylindrica, Anacystis nidulans and Nostoc muscorum are able to adjust the pH of culture medium from stress levels (pH 4-6) to levels favorable for growth (pH 7-10). Over a period of one week, these strains increased the buffer capacity of their media with time. The pH of maximum buffer capacity after one week was very close to the pK2 of phosphoric acid. Algae grown in a medium initially buffered with Na2CO3 shifted the pH of maximum buffer capacity from the pK of carbonic acid to that of phosphoric acid.
W79-03772

MICROBIOLOGY-WATERBORNE OUTBREAKS, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, OH.
G. F. Craun.
Journal Water Pollution Control Federation, Vol. 46, No. 6, p. 1384-1395, June, 1974. 89 ref.

Descriptors: *Microbiology, *Water pollution effects, *Diseases, Chemicals, *Reviews, *Bibliographies, Gastroenteritis, Typhoid, Hepatitis, Shigellosis, Salmonellosis, Amoebic meningoencephalitis, Naegleria fowleri, Cholera, Dracontiasis, Leptospirosis, Schistosomiasis, Shellfish poisoning.

A review was made by Craun and McCabe of the causes of waterborne-diseases occurring in the United States during the period 1946 to 1970. There were a recorded 358 outbreaks of diseases or poisoning from contaminated drinking water. Illnesses were of five major categories: gastroenteritis of unknown etiology (178 outbreaks), typhoid (53 outbreaks), infectious hepatitis (53 outbreaks), shigellosis (53 outbreaks) and salmonellosis (13 outbreaks). Seventy-one percent of the outbreaks resulted from the contamination of private, individual water systems, while 83 percent of the illness was a result of polluted community water systems. The distribution system of the community facilities was the major cause through cross-connections and back siphonage. Data indicate that waterborne diseases are on the increase during the last three decades. A slight increase in mortalities has occurred for gastritis, duodenitis, enteritis, and colitis in persons over 65, however, it is still significantly lower than was observed in the 1920's. (Leibowitz-FIRL)
W79-03773

CULTURAL EUTROPHICATON OF LONG LAKE, WASHINGTON,
Eastern Washington State Coll., Cheney. Dept. of Biology.
R. A. Soltero, A. F. Gasperino, and W. G. Graham.
Verhandlunger Internationale Vereinigung fur Limnologie, Vol. 19, p. 1778-1789, November, 1975. 5 fig, 28 ref. OWRT A-058-WASH(5).

Descriptors: *Nutrients, Nitrate nitrogen, Orthophosphate, Density current, Primary productivity, Chlorophyll, Oxygen depletion, Phytoplankton, Zooplankton, *Eutrophication, *Washington, Long Lake(Wash), Water pollution effects.

Long Lake has become a popular recreational site, which has resulted in extensive development of permanent and weekend dwellings along its shores. However, in the last ten years, there has been complaints about the deterioration of the reservoir's water quality. Massive algal blooms and greater growths of aquatic macrophytes have been chief sources of concern. This investigaton was undertaken to determine the trophic status of Long Lake and to correlate changes in primary production to the physical and chemical environment in the reservoir. Changes in zooplankton populations were related to changes in phytoplankton populations.
W79-03777

SCENARIO FOR AN ONGOING CHLOROPHYLL A SURVEILLANCE PLAN ON LAKE ONTARIO FOR NON-INTENSIVE SAMPLING YEARS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W79-03808

CARBON FLOW IN FOUR LAKE ECOSYSTEMS: A STRUCTURAL APPROACH,
Washington Univ., Seattle. Fisheries Research Inst.
J. E. Richey, R. C. Wissmar, A. H. Devol, G. E. Likens, and J. S. Eaton
Science, Vol 202, NO 4373, p 1183-1186, December 15, 1978. 2 tab, 13 ref. NSF DEB76-82283

Descriptors: *Lakes, *Carbon, *Nutrients, On-site data collections, On-site investigations, Eutrophication, Water quality, Organic compounds, Organic matter, Ecosystems, Watersheds(Basins), Forest watersheds, Urbanization, Limnology, Carbon flux.

Direct and indirect carbon fluxes in lakes Marion (British Columbia), Findley (Washington), Wingra (Wisconsin), and Mirror (New Hampshire) were compared, using budgets and input-output analysis. Overall differences in carbon flow between the lakes were shown with cycling indices of 0.031, 0.108, 0.572, and 0.661, respectively. The results suggested that lake ecosystems may be considered unique aggregations of similar components. (Sims-ISWS)
W79-03815

IMPACT OF NEARSHORE DEVELOPMENT ON OPEN COASTAL RESOURCES,
Southern California Coastal Water Research Project, El Segundo, CA.
A. J. Mearns, and D. R. Young
In: Southern California Ocean Studies Consortium Technical Paper No. 1, 'The Urban Harbor Environment', 1978. Presented at the First Southern California Ocean Studies Consortium Symposium, held Long Beach, California, on 16 April 1977. p 23-48, 4 fig, 3 tab, 47 ref.

Descriptors: *Coastal zone, *Resources development, *California, *Harbors, Trace metals, Pollutant identification, Sewage effluents, *Outer Continental Shelf, *Nearshore environment, Chlorinated hydrocarbons.

Recent studies which are relevant to understanding the combined and separate effects of coastal and harbor activities on chemical and biological conditions along the coast of southern California are summarized. The chemical summary presents new data on the coastal distribution of trace metals, chlorinated hydrocarbons and biological accumulation of some trace contaminants. Comments on biological effects focus on the now well studied soft bottom communities at open coastal discharge sites. Previous studies, including monitoring surveys, have generally centered around descriptions of the faunal complexities at individual waste discharge sites. In this paper (1) the biological similarities among large and small coastal discharge sites, particularly those which show promise as management tools and (2) which pollutants appear to be most important in causing the kinds of effects observed around most sewage discharge sites are explored. (Sinha-OEIS)
W79-03829

PROCEEDINGS OF THE 1977 OIL SPILL RESPONSE WORKSHOP.
National Coastal Ecosystems Team, NSTL Station, MS.
For primary bibliographic entry see Field 5G.
W79-03830

STATUS AND FUTURE TRENDS IN OIL SPILLS AND IMPLICATIONS FOR THE U.S. FISH AND WILDLIFE SERVICE,
Fish and Wildlife Service, Washington, DC. Office

of Migratory Bird Management.
For primary bibliographic entry see Field 5G.
W79-03831

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAND AND FEDERAL RESPONSIBILITIES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03832

CALIFORNIA'S RESPONSE TO POLLUTION INCIDENTS,
California State Dept. of Fish and Game, Long Beach
For primary bibliographic entry see Field 5G.
W79-03833

FATE OF OIL IN THE SEA,
Skidaway Inst. of Oceanography, Savannah, GA.
R F Lee
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No. FWS/OBS/77-24, September 1977. p 43-54, 2 fig, 52 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Biodegradation, Coasts, Estuaries, Sediments, Weathering, Microbial degradation, Water quality control, *Outer Continental Shelf.

The fate of oil spills at sea depends on the composition of the oil, as well as such external factors as light and temperature. The extent of degradation also depends on the type of coastal area in which the spill occurs. In open, exposed coastline areas, with good circulation of water, most fractions of spilled oil are soon degraded. In protected shallow areas with less circulation, spilled oil is incorporated into sediments and much of it remains unaltered for many years. Photo-oxidation, dissolution, emulsification, adsorption to particles, biodegradation, and uptake by marine animals are not processes that act independently, but the interactions of all of these determine the fate of oil in water. The various filter feeders, grazers, and deposit feeders of the meiofauna and macrofauna utilize the organic matter of the sediment. In this process, they may expose deeper sediments to the water sediment interface where there is more microbial activity. The involvement of both microbes and animals in hydrocarbon degradation in marine sediments may be similar to their symbiotic association in recycling organic material in terrestrial sediments. (See also W79-03830)(Sinha-OEIS
W79-03835

ASSESSING THE BIOLOGICAL IMPACT OF OIL SPILLS: A NEW ROLE FOR EPA BIOLOGISTS,
Environmental Protection Agency Edison, NJ.
R. J. Nadeau.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No. FWS/OBS/77-24, September 1977. p 55-60.

Descriptors: *Oil spills, *Environmental effects, *Water pollution effects, *Oil pollution, Biota, Ecosystems, Mortality, *Outer Continental Shelf.

The effect that an oil spill has on aquatic ecosystems is influenced by a number of factors: type of oil spilled and volume, hydrography of the oil spill area, climatic and seasonal changes, indigenous biota, treatment methods used during the cleanup, and previous exposure to the spill area to oil pollution. Some of the specific effects that oil has on living systems or populations include but are not necessarily limited to, the following: death as a result of coating and asphyxiation; death through contact poisoning, death from exposure to water-soluble toxic compounds; destruction of sensitive juvenile forms; destructions of food sources or support populations, incorporation of sublethal amounts, resulting in the reduced resistance of species to infection or stresses; and incorporation of sublethal amounts, producing an off-flavor or taint in exploitable species, thereby causing an economic loss to man. (See also W79-03830)(Sinha-OEIS)
W79-03836

EFFECTS OF OIL ON AQUATIC BIRDS,
Fish and Wildlife Service, Laurel MD. Patuxent Wildlife Research Center.
P. H. Albers
In: Proceedings of the 1977 Oil Spill Response Workshop, held Matairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication NO FWS/OBS/77-24, September 1977. p 61-68, 3 tab, 24 ref

Descriptors: *Oil petroleum, *Birds, *Water pollution effects, *Environmental effects, Ecosystems, Mortality, Analytical techniques, *Outer continental shelf, *Sublethal effects, Seabirds

There is some evidence of the impact of direct mortality from oil spills on bird populations, but very little is known about the sublethal and indirect effects of oil on birds. Research at the Patuxent Wildlife Research Center, Laurel, Maryland, is directed at (1) determining the effects of petroleum on the physiology and reproductive success of birds, and (2) developing the analytical methodology necessary for detection of petroleum in avian tissues. (See also W79-03830) (Sinha-OEIS)
W79-03837

CONTAINMENT AND RECOVERY TECHNIQUES FOR SPILLED OIL IN THE MARINE ENVIRONMENT,
National Coastal Ecosystems Team, NSTL Station, MS
For primary bibliographic entry see Field 5G
W79-03838

CHEMICAL OIL DISPERSING AGENTS AND THEIR FEASIBILITY FOR USE,
Exxon Research and Engineering Co., Florham Park, NJ
For primary bibliographic entry see Field 5G.
W79-03839

RESTORATION OF OIL-CONTAMINATED SHORELINES,
URS Co., San Mateo, CA
For primary bibliographic entry see Field 5G
W79-03840

SYMPOSIUM: EXPERIMENTAL USE OF ALGAL CULTURES IN LIMNOLOGY; SANDEFJORD, NORWAY, 26-28 OCTOBER 1976.
Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Stuttgart (Germany, F.R.).
Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No 21, Stuttgart, June 1978. 607 p. $40.00.

Descriptors: *Cultures, *Phytoplankton, *Limnology, *Algae, *Testing procedures, *Bioassay, *Limiting factors, Nutrients, Phosphorus, Nitrogen, Phosphates, Light intensity, Poisons, Toxicity, Culture media, Selenastrum capriconutum, Eutrophication, Water pollution effects, Laboratory tests, Methodology, Analytical techniques, Lakes, Plant growth, Growth rates, Bottle test, Pollutants, Absorption, Model studies, Succession, Algal growth potential, Water chemistry

Fifty-two papers include an introductory presentation, eight papers on methods, 17 on algal physiology, and 26 on applications. Rodhe in 1948 demonstrated the value of experimental cultures in studying the environmental requirements of algae. In 1960-62 the chlorophyte Selenastrum capriconutum, discovered in 1913, was evaluated experimentaly as a bioassay test organism, and in succeeding years was increasingly adopted in such studies, notably those assessing effects of toxic substances and nutrient enrichment. In 1971 it was establishe as a routine test organism in EPA's algal assa bottle test, and algal assays have become an impor tant method of evaluating water quality. Severa papers discuss testing techniques, including batch continuous, and semicontinuous cultures, the bottl test, turbidostats, and chemostats. Numerou papers report experimental results on limiting nu trients, nutrient stimulation of algal growth, an growth inhibition by toxic substances. Other sub jects include nutrient uptake kinetics, phytoplank ton growth cycles, light limitation, mathematica models, lipid surface films, bioaccumulation, bio vailability of nutrients, hot spring algae, pigment ecology, competition, zooplankton, succession, an growth regulators. (See W79-03843 thru W79 03894) (Lynch-Wisconsin)
W79-03842

ALGAE IN CULTURE AND NATURE,
Uppsala Univ. (Sweden) Inst of Limnology
W. Rodhe
In: Symposium: Experimental Use of Algal Cu tures in Limnology, 26-28 October 1976, Sande jord, Norway. Internationale Vereinigung f Theoretische und Angewandte Limnologie, Mitte lungen No 21, June 1978, p 7-20. 1 fig, 5 ta

Descriptors: *Algae, *Cultures, *Nutrients, *Ph toplankton, *Culture media, *Plant growth, Sele astrum capricornutum, Lakes, Limnology, Labor tory tests, Methodology, Laboratory equipmen Testing procedures, PAAP medium, Z8 mediu Limiting factors, Eutrophication, Bioassay

The history of efforts to create artificial cultu media of algae is reviewed in brief, and nutrition aspects of freshwater planktonic algal cultures discussed. Three tables compare the algae cultur of Beijerinck (1898), Chu 10 (1942), Rodhe V (1948), and Provasoli and Pintner for Synu (1953) with representative lake water compositi (derived from world average data). In most fres water, four cations (calcium, magnesium sodiu and potassium) and three anions (chlorine, sulfa and HCO3) constitute close to 100% of the to ionic content. In composing synthetic media, co centrations of growth-limiting nutrients are rais over natural levels and surplus constituents a reduced, since in algal cultures higher growth ra than in nature are usually desired. The two maj culture media for the common test alga, Selen trum capricornutum, are described: (1) Skulber Z8, and (2) the PAAP (formerly ASM) mediu developed by the Division of Applied Biology Ottawa, Canada. The two media contain virtua no common denominator of nutritional sign cance. Though the concept of a single limiti factor and Liebig's Law of the Minimum ha been shown to be inaccurate, the correct conc of several interdependent growth factors is still universally applied. (See also W79-03842) (Lyn Wisconsin)
W79-03843

ALGAL ASSAY PROCEDURE WITH ONE FIVE SPECIES. MINITEST,
Uppsala Univ. (Sweden). Algal Assay Lab
For primary bibliographic entry see Field 5A
W79-03844

THE CULTURE COLLECTION POINT VIEW,
Culture Centre of Algae and Protozoa, Cambri (England)
For primary bibliographic entry see Field 5A
W79-03845

PHYSIOLOGICAL INDICATORS OF NUT ENT DEFICIENCY IN ALGAE,
Fisheries and Marine Service, Winnipeg (Man ba). Freshwater Inst
For primary bibliographic entry see Field 5A
W79-03846

A MODIFIED TURBIDOSTATIC SYSTEM F ALGAL POPULATION STUDIES,

Euratom European Community, Varese (Italy).
For primary bibliographic entry see Field 5A.
W79-03847

SOLUBILIZATION OF BIOLOGICALLY AVAILABLE PHOSPHORUS BY AUTOCLAVING SELENASTRUM,
FMC Corp., Princeton, NJ. Research and Development Dept.
For primary bibliographic entry see Field 5A.
W79-03848

CULTURES OF CLADOPHORACEAE IN WATER POLLUTION PROBLEMS,
Zurich Univ. (Switzerland). Pflanzenbiologisches Inst.
For primary bibliographic entry see Field 5A.
W79-03849

COMPARISON OF BIOASSAY PROCEDURES FOR GROWTH-LIMITING NUTRIENTS IN THE LAURENTIAN GREAT LAKES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5A.
W79-03850

PRINCIPAL ASPECTS CONCERNING THE BATCH TECHNIQUE IN ALGAL ASSAYS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5A.
W79-03851

GROWTH OF OSCILLATORIA AGARDHII IN CHEMOSTAT CULTURE. 2. DEPENDENCE OF GROWTH CONSTANTS ON TEMPERATURE,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5A.
W79-03852

THE EFFECTS OF SOME METALLIC IONS ON THE GROWTH OF CHLAMYDOMONAS VARIABILIS AND EUGLENA GRACILIS,
Paris-11 Univ. (France).
J. Bonaly, A. Delacourt, and J. C. Mestre.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandelfjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 103-109. 5 fig, 5 ref.

Descriptors: *Chlamydomonas variabilis, *Euglena gracilis, *Ions, *Heavy metals, *Growth rates, Toxicity, Plant growth, Algae, Phytoplankton, Lethal limit, Water pollution effects, Salts, Mercury, Cadmium, Chromium, Copper, Chlorophyta, Water quality standards.

The toxicity threshold of concentrations of various metallic ions was determined for two phytoplankters, Chlamydomonas variabilis and Euglena gracilis. The ions, including mercury (++), cadmium (++), chromium (6+), and copper (2+), were added to flasks containing 50 ml of axenic algal suspension, placed in a phytotronic basin with temperature fixed at 23C and continuous illumination at 5200 lux fluorescent light, and agitated at 1/min. Cell growth was determined by daily cell counting with a Cytograf 6301 or Coulter counter. Two types of toxic action could be distinguished in sublethal concentrations: (1) With mercury and chromium (6+) the growth curve gradient was not affected and, on the contrary, sublethal concentrations gave rise to a log-phase at the beginning of growth, the length of which varied directly with the level of the toxic substance; toxic threshold varied inversely with cell number/ml. (2) The increase of the cellular mitosis rate was proportional to the toxic concentration, resulting in a correlative decrease of the curve gradient in its exponential phase. The distinction between these two actions should not be overemphasized. The mechanism of toxicity were very low diverse and complex. A compound's toxic threshold is directly dependent on initial algal concentration, which must be kept in mind when setting water pollution standards. (See also W79-03842) (Lynch-Wisconsin)
W79-03853

THE EFFECT OF SEWAGE (MECHANICALLY, BIOLOGICALLY, AND CHEMICALLY TREATED) ON ALGAL GROWTH,
Vandkvalitetsinstitute, Hoersholm (Denmark).
E. Gargas.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 110-124. 7 fig, 6 tab, 8 ref.

Descriptors: *Guden River(Denmark), *Phytoplankton, *Sewage treatment, *Biological treatment, *Mechanical treatment, *Chemical treatment, Denmark, Lake Brass(Denmark), Lake Silkeborg Lang(Denmark), Secchi disks, Chlorophyll, Laboratory equipment, Growth rates, Plant growth, Water pollution effects, Eutrophication, Phosphorus, Batch cultures, Bioassay, Nutrients, Algae, Rivers, Lakes, Selenastrum capriconutum, Chlorophyta.

In-situ and laboratory batch algal assay experiments were carried out to determine effects of various types of sewage treatment on algal growth in the River Guden system, Denmark. The River Guden flows from Lake Brass through the eastern part of Lake Silkeborg Lang, where it receives primary treated sewage from the Soholt treatment plant. Since sewage treatment (90% chemically-based) would only marginally increase Secchi depth, due to phosphorus inputs from sources other than the treatment plant. Total nutrient loading must be reduced to significantly improve water quality in the lake. In laboratory experiments, Selenastrum capricornutum was tested in water from Lake Brass, to which mechanically or biologically/chemically treated sewage was added at different concentrations. Field measurements were carried out in Lake Brass in 300-liter polyethylene bags filled with untreated lake water to which sewage was added. In laboratory tests, sewage loadings caused an increase in potential production; algal biomass increased with increasing sewage loadings, particularly when water was spiked with mechanically treated sewage. During field tests it was not possible to estimate the effect of sewage loadings on natural phytoplankton population growth. Effects of 0%, 5%, and 10% loading of mechanically or biologically/chemically treated sewage on Secchi depth in the two lakes is given. (See also W79-03842) (Lynch-Wisconsin)
W79-03854

ON THE KINETICS OF LIGHT-LIMITED GROWTH OF SCENEDESMUS PROTUBERANS FRITSCH AND ECOLOGICAL IMPLICATIONS,
Amsterdam Univ. (Netherlands). Lab. for Microbiology.
H. J. Gons, and L. R. Mur.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 125-135. 5 fig, 1 tab, 13 ref.

Descriptors: *Scenedesmus protuberans, *Kinetics, *Light intensity, *Growth rates, *Limiting factors, *Plant growth, Temperature, Algae, Phytoplankton, Ecology, Monod equation, Photoperiodism, Batch cultures, Photorespiration, Absorption, Chlorophyta.

The growth of the chlorophyte Scenedesmus protuberans in light-limiting conditions was studied in continuous cultures, and the relationship between specific growth rate (mu) and light intensity (I) in dilute suspensions was measured. The relationship between mu and the specific light uptake rate (dE/dt-1/X) was diphasic and linear at both 20 and 28C at low light intensities; at high light intensities additional phases were distinguished. The phases are: (1) a linear relationship at low light intensity and uptake rate, (2) the onset of photorespiration at a certain light intensity (dependent on temperature), (3) attainment of full physiological potential at which point further increase of light intensity has no further effect, and (4) the point at which light becomes damaging and growth is inhibited. An improved light irradiance measurement method developed subsequent to presentation showed that average light intensities and specific light uptake rates were underestimated by a magnitude of three; qualitative conclusions are nevertheless unaffected. One-liter cultures in cylindrical double-walled Pyrex vessels were illuminated by circular fluorescent lamps on a light-dark cycle of 16 and 8 hours. Average light intensity was determined by measurement of light intensity in empty vessels (with water between the walls) at fixed points on the inner surface. (See also W79-03842) (Lynch-Wisconsin)
W79-03855

GROWTH CYCLE OF A FRESHWATER DIATOM,
Miliostyrelsen, Silkborg (Denmark). Freshwater Lab.
C. Hunding.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 136-146. 6 fig, 24 ref.

Descriptors: *Nitzschia palea, *Diatoms, *Biorhythms, *Photosynthesis, *Photoperiodism, *Growth stages, *Light intensity, Life cycles, Algae, Periphyton, Plant growth, Light, Cell number, Cell volume, Microalgae, Darkness, Growth rates, Semicontinuous cultures, Limnology, Chrysophyta.

The growth cycle of the freshwater periphytic diatom Nitzschia palea was studied in semicontinuous laboratory culture to illustrate some aspects of their behavior as a natural population and to determine the precise sequence of events when cells are cultured in alternating light and dark periods of 12 hours each. Microalgae tend to be synchronized in their cell development under natural light regimens, and significant diurnal variations in such cell characteristics as the rate of photosynthesis, increase in cell number and cell volume, and chlorophyll-a concentration may be expected to occur in natural populations. The findings are important to pollution studies, since the microalgae apparently are more sensitive to various stress factors at some stages of their life cycles than at others. The light-dark growth cycle induced a periodicity in the algal culture. The increase rate of cell particle number was 3.3/day, with two distinct periods of increased growth rate: (1) beginning about seven hours after the start of the light period, and (2) beginning about four hours after the start of the dark period. The average size of cell particles decreased during periods of high growth rates, while the size range increased. At the onset of light the algal population consisted almost exclusively of small cells. Photosynthetic rate increased exponentially during early light, but was significantly reduced when cells sampled at the beginning of dark were exposed to a high quantum flux. (See also W79-03842) (Lynch-Wisconsin)
W79-03856

NUTRIENT KINETICS OF FRESHWATER PLANKTONIC ALGAE USING BATCH AND SEMICONTINUOUS METHODS,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W79-03857

LIGHT-LIMITED CULTURES OF THE BLUE-GREEN ALGA OSCILLATORIA AGARDHII,
Amsterdam Univ. (Netherlands). Lab. for Microbiology.
L. Van Liere, and L. R. Mur.
In: Symposium: Experimental Use of Algal Cul-

tures in Limnology, 26-28 October 1976. Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Mitteilungen No 21, June 1978. p 158-167. 7 fig, 3 tab, 10 ref.

Descriptors: *Oscillatoria agardhii, *Phytoplankton, *Light intensity, *Limiting factors, *Plant growth, *Growth rates, Algae, Cyanophyta, Light, Cultures, Batch cultures, Chemostats, Succession, Eutrophication, Scenedesmus protuberans, Lakes, Model studies, Mathematical models, Kinetics, Energy budget, Equations

Cultures of the cyanophyte Oscillatoria agardhii were grown under light-limiting conditions to study growth kinetics, in part to permit comparison with kinetics of the chlorophyte Scenedesmus protuberans to explain the succession of green to blue-green algae in eutrophic lakes. A model developed by Gons and Mur (1975) to describe growth in light-limited conditions was used (dE dt)c = muX + (mu sub e) X, where dE dt is the absorbed light energy, c is the efficiency factor, X is biomass, mu is the specific growth rate constant, and mu sub e is the specific maintenance rate constant. In batch cultures, three surface light intensities were tested with fluorescent illumination: 0.5, 2.5, and 4.8 W sq m. Maximal cell density increased sharply with light intensity up to 2.5 W sq m, at which point the slope of the curve flattened. However, the energy absorbed per unit dry weight increased linearly with light intensity, leading to the conclusion that more energy per unit dry weight is needed at higher light intensities, which may have an effect on mu sub e, when c is a constant. In chemostat experiments, especially at high light intensity, changes in light intensity, temperature, pH, and dilution rate sometimes had persistent traumatic effects. Processes which decrease efficiency (c), such as photorespiration and spillage of ATP or reductants, are dependent not only on growth rate, but also on the time cell is exposed to light. High light intensity repressed pigment synthesis. (See also W79-03842) (Lynch-Wisconsin)
W79-03858

SELENIUM AS A MICRONUTRIENT FOR THE DINOFLAGELLATE PERIDINIUM CINCTUM FA. WESTII.

Uppsala Univ. (Sweden). Inst. of Limnology
K. Lindstrom, and W. Rodhe
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976. Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Mitteilungen No 21, June 1978. p 168-173. 4 fig, 1 tab, 1 ref.

Descriptors: *Peridinium cinctum fa westii, *Dinoflagellates, *Selenium, *Nutrients, *Plant growth, *Culture media, *Limiting factors, Phytoplankton, Algae, Lake Kinneret(Israel), Israel, Lake Erken(Sweden), Sweden, Micronutrients, Bioassay, Testing procedures, Methodology, Photosynthesis, Growth rates, Lakes, Pyrrophyta

Discovery of selenium as the essential growth factor in water of Lake Kinneret, Israel enabled the first successful culture of the dinoflagellate Peridinium cinctum fa. westii by Carefoot (1968) in a medium supplemented with vitamins, trace metals, and water from the lake. Using an entirely mineral medium (Lindstrom no. 9), a maximum specific growth rate of 0.16 was reached at 50 ng Se l., giving a half-saturation constant (K sub s) of 7.5 ng Se l. Increase of cell numbers in the Lindstrom no. 9 synthetic medium was comparable to the Carefoot medium with water from Lake Erken, Sweden. More than 15,000 cells/ml was attained after 58 days, while controls without selenium failed to yield significant cell numbers. Addition of selenium to Lake Erken water at 158 ng/l almost tripled the yield after 69 days, indicating that, in addition to being an indispensable constituent of Peridinium, selenium may limit its production in nature. When other nutrients were in surplus, selenium concentration was the exclusive determinant of the production of living cells, final cell yields as empty shells, and rates of oxygen production. Selenium also determined gross photosynthetic oxygen production which exceeded 600 pg O2 cell/hr at selenium concentrations over 30 ng/l. A bioassay procedure is described which permits determination of selenium concentrations in lake water down to about 5 ng/l. It is believed that the primary effect of selenium for this alga is enzymatic. (See also W79-03842) (Lynch-Wisconsin)
W79-03859

THE MECHANISMS OF CARBON DIOXIDE FIXATION IN PHYTOPLANKTON.

Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.
L. Morris, J. Beardall, and D. Mukerji
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976. Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Mitteilungen No 21, June 1978. p 174-183. 3 fig, 4 tab, 21 ref. NSF DES 75-15104, DES 75-22128.

Descriptors: *Phytoplankton, *Carbon dioxide, *Photosynthesis, *Pathways, *Phaeodactylum tricornutum, *Skeletonema costatum, *Dunaliella tertiolecta, Carbon, Marine algae, Diatoms, Flagellates, Chlorophyta, Algae, Primary productivity, Carbon radioisotopes, Metabolism, Carboxylases, Tracers, Bicarbonates, Ions, Fixation

Three marine algae, Skeletonema costatum, Phaeodactylum tricornutum, and Dunaliella tertiolecta, were used to study the path of carbon assimilation during photosynthesis, specifically: (1) the short-term pattern of C14-carbon dioxide fixation, (2) activities of carboxylases in cultures of marine algae, (3) correlation between changing photosynthetic rates and carboxylase activities, and (4) carbon dioxide species used by carboxylases. The mechanism of photosynthetic carbon dioxide assimilation in some marine algae differs from that generally assumed to operate in algae. Certain conclusions are suggested by the fact that the central features of the short-term pattern of carbon dioxide fixation correlate with the relative activities of RuDP Case/PEP Case, and that these features vary among algae and with the physiological state of the cells. (1) Under certain conditions some marine algae (especially diatoms) fix the bicarbonate ion through an active PEP Case, the C3 acceptor for this fixation is regenerated by a decarboxylation reaction which provides carbon dioxide for fixation by the RuDP Case of the Calvin cycle. (2) Under other conditions certain marine algae (especially green flagellates) fix carbon dioxide directly by the RuDP Case with quantitatively less fixation occurring by the PEP Case reaction. The ability of an alga to regulate a switch from a C3 mechanism to a C4 mechanism of CO2 fixation under changing environmental conditions might be important in species selection among phytoplankton populations. (See also W79-03842) (Lynch-Wisconsin)
W79-03860

PHOSPHORUS KINETICS--ALGAL GROWTH RELATIONSHIPS IN BATCH CULTURES.

Toronto Univ. (Ontario).
C. Nalewajko, and D. R. S. Lean.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976. Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Mitteilungen No 21, June 1978. p 184-192. 5 fig, 2 tab, 15 ref.

Descriptors: *Batch cultures, *Phosphorus, *Kinetics, *Phytoplankton, *Plant growth, *Testing procedures, *Perturbation experiments, *Steady-state experiments, Growth rates, Algae, Absorption, Phosphates, Nutrients, Ababaena flos-aquae, Scenedesmus quadricauda, Navicula pelliculosa, Nutrient flux, Cyanophyta, Chlorophyta

Axenic cultures of Anabaena flow-aquae, Navicula pelliculosa, and Scenedesmus quadricauda were used as inocula for batch cultures to (1) ascertain if phosphate exchange between algal cells and the medium was as important as earlier work suggested, and (2) to compare the perturbation and steady-state approaches to phosphate uptake kinetics. Data confirm that phosphate movement is not one-way entry from medium to algal cells, but rather an exchange, and even during early logarithmic growth the influx may greatly exceed net phosphate uptake. In contrast to the earlier studies the same culture was used to follow net uptake and influx of phosphate. Turnover times of the phosphate pool in the medium were not as short as reported previously. The shortest turnover time (28.6 min) was detected in the Ababaena culture on the sixth day of growth, compared to 2.7 min for that species in the earlier study. A possible explanation is that experimental duration in the present study was not as long as in the earlier ones and therefore phosphate limitation was not as severe. Although phosphate turnover times in the cultures do not approach the fastest lake water values, it is still concluded that algae as well as (or rather than) bacteria are responsible for the fast phosphate uptake in lakes. K sub s values for the three species ranged from 10-400 micrograms PO4-P/l and increased markedly during growth as phosphate depletion occurred. V sub max decreased with increasing growth rate and with increasing cell phosphorus content. (See also W79-03842) (Lynch-Wisconsin)
W79-03861

A MATHEMATICAL MODEL FOR GROWTH OF PHYTOPLANKTON.

Novo Industri A/S, Bagsvaerd (Denmark)
N. Nyholm
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976. Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Mitteilungen No 21, June 1978. p 193-206. 2 fig, 4 tab, 4 ref.

Descriptors: *Phytoplankton, *Mathematical models, *Kinetics, *Eutrophication, *Lakes, *Algal growth, Algae, Denmark, Shallow water, Biomass, Dry weight, Nutrients, Phosphorus, Nitrogen, Limiting factors, Growth rates, Forecasting, Depth, Water temperature

A kinetic phytoplankton growth model is presented as a submodel for predicting eutrophication in receiving waters in a shallow pond, using data from the Guden River system, Denmark. Currently in use at Denmark's Water Quality Institute, the model has proved useful for simulating algal growth in several shallow, eutrophic lakes. The model treats phytoplankton as a single unit and ignores individual species. Growth is described as average growth of biomass dry weight; the model does not account for diurnal rhythms. Phosphorus and nitrogen alone are potential limiting nutrients. Specific growth rate at a particular depth is expressed as a function of light intensity, day length, temperature, and intracellular concentrations of nitrogen and phosphorus. Under limiting conditions, instantaneous nutrient uptake is assumed, while the transition regime the uptake rate is assumed proportional to the extracellular substrate concentration, and with conditions of surplus nutrient, nutrient uptake is proportional to growth of mass. A logic incorporated into the model ensures no discontinuities during intergration of the mass balance equations. The dynamic description of nutrient dependence makes it possible to predict that a large algal standing crop can develop and maintain a comparatively high production rate in an environment of very low dissolved nutrients. (See also W79-03842) (Lynch-Wisconsin)
W79-03862

THE VARIABLE CHLOROPHYLL-A FLUORESCENCE AS A MEASURE OF PHOTOSYNTHETIC CAPACITY IN ALGAE.

Oslo Univ. (Norway). Botany Lab.
For primary bibliographic entry see Field 5A.
W79-03863

PLEOMORPHISM OF SCENEDESMUS QUADRICAUDA (TURP.) BREB. (CHLOROPHYCEAE) IN SYNCHRONIZED CULTURES.

Hydrobiologisch Laboratorium, Nijmegen (Netherlands).
C. J. M. Stevenbergen

n: Symposium: Experimental Use of Algal Cul-
ures in Limnology, 26-28 October 1976, Sandef-
ord, Norway. Internationale Vereinigung fur
heoretische und Angewandte Limnologie, Mitte-
ungen No. 21, June 1978, p216-223. 3 fig, 3 tab, 17
ef.

Descriptors: *Scenedesmus quadricauda, *Plant
norphology, *Pleomorphism, *Coenobia, *Uni-
ells, Algae, Cultures, Phosphorus, Nutrients, Pho-
operiodism, Biorhythms, Cytological studies,
Buoyancy, Ecology, Survival, Chlorophyta.

Manipulation of environmental conditions pro-
uced various degrees of morphological change in
pleomorphic strain of the chlorophytic alga
cenedesmus quadricauda. Three morphologically
able synchronized culture systems were achieved
hich yielded either coenobia or unicells: (1) only
our-celled coenobia were formed in synchronized
ultures grown at 30C in a medium containing
800.5 mg/l total inorganic salts; (2) partially syn-
hronized cultures consisting of two-, four-, and
ight-celled coenobia developed when grown at
0C in a medium containing 130.5 mg/l total inor-
anic salts; and (3) a completely synchronized
norphologically stable unicell-yielding culture
ystem was achieved at 20C with high nutrient
evels (1800.5 mg/l). Cultures were synchronized
ith 14-hr light and 10-hr dark cycles, and were
luted daily with fresh nutrient medium to the
riginal cell density of about 400,000 cells/ml.
ncreasing the nutrient levels in System 2 failed to
eld a unicellular system, but in System 3 shorten-
g day length to three hours changed the system
partly coenobial. Spiny Scenedemus species are
ble to produce both unicellular and coenobial
ages, as observed in both natural and laboratory
opulations. Phosphorus enrichment is known to
ve rise to unicell production, as does a relatively
ng photoperiod. This pleomorphism may favor
rvival of the organism as the relative buoyancy
unicells or coenobia enable them to seek surface
bottom nutrient-rich waters, respectively. (See
so W79-03842) (Lynch-Wisconsin)
79-03864

**ITROGEN AND PHOSPHORUS STORAGE
ND UTILIZATION IN BLUE-GREEN ALGAE,**
undee Univ. (Scotland). Dept. of Biological Sci-
nces.
. D. P. Stewart, M. Pemble, and L. Al-Ugaily.
: Symposium: Experimental Use of Algal Cul-
res in Limnology, 26-28, October 1976, Sandef-
rd, Norway. Internationale Vereinigung fur
heoretische und Angewandte Limnologie, Mitte-
ngen No. 21, June 1978, p 224-247. 14 fig, 3 tab,
ref.

escriptors: *Cynaophyta, *Nitrogen, *Phospho-
s, *Storage, *Eutrophication, *Balgavies
och(Scotland), Lakes, Scotland, Nutrients, Ana-
ena cylindrica, Anabaena flos-aquae, Phyto-
ankton, Algae, Water pollution effects, Biomass,
hlorophyll, Plant growth, Polyphosphate bodies,
ructured granules, Polyhedral bodies, Plant mor-
ology.

oor correlation between blue-green algal biomass
d levels of dissolved nitrogen and phosphorus in
e water column of Balgavies Loch, Scotland is
rtially due to the ability of cyanophytes to accu-
ulate and store cellular reserves of nitrogen,
osphorus, and other material. They may store a
riety of compounds intracellularly in nontoxic
rm and as discrete bodies which they can mobi-
e readily if required. In particular, their ability to
cumulate structured granules and polyphosphate
dies provides a supply of ribulose 1,5-diphos-
ate carboxylase, the key enzyme for photosyn-
etic carbon fixation. Accumulation of these com-
unds and others such as lipoid droplets may be
ucial in sustaining the algae because: (1) they
ay sustain growth when exogenous sources of
trients are limiting, which helps explain how
gal blooms develop when nutrient supplies are
parently depleted; (2) accumulation of storage
dies when algal growth is declining may explain
w nonporulating algae (such as Microcystis
w-aquae) sustain themselves during winter; and
the ability to accumulate nutrients in one area
and use them in other areas of the water column is probably an ecological advantage. Anabaena cylindrica and A flos-aquae were used in laboratory experiments. (See also W79-03842) (Lynch-Wisconsin)
W79-03865

COMPOSITION AND PROPERTIES OF LIPID SURFACE FILMS PRODUCED BY CHLORELLA PYRENOIDOSA,
Lund Univ. (Sweden). Limnological Inst.
A. Sodergren.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Thoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 248-253. 1 fig, 1 tab, 17 ref.

Descriptors: *Chlorella pyrenoidosa, *Lipids, *Surface films, *Fatty acids, *Acids, *Sampling, Algae, Chlorophyta, Continuous flow, Batch cultures, Air-water interfaces, Lakes, Oceans, Phytoplankton, Chromatography, Research equipment, Methodology, Microlayers, Spectrometers, Organochlorine compounds, Polychlorinated biphenyls, Fungicides, Pollutants, Water pollution effects, On-site tests.

The lipid surface film produced by the chlorophytic alga Chlorella pyrenoidosa in continuous-flow and batch cultures was collected with a teflon plate technique (Larsson, et al 1974) and examined by thin-layer and gas chromatography and by mass-spectrometry. To study the composition of the film and to follow organic compounds produced within the cultures, $NaH^{14}CO_3$ was added as a tracer. Myristic acid, palmitic acid, stearic acid, and oleic acid were found in quantities of 2-63 ng/sq cm, with palmitic acid the dominating constituent among free fatty acids, and the pattern of fatty acids in the film was different from that in the algae. Film properties were studied by introducing the lipophilic substances hexachlorobenzene (a fungicide) and hexachlorobiphenyl (a PCB) into the cultures. The major part of these compounds was taken up by the algae, but the surface film also accumulated large amounts. The compounds were transported to the surface film even though the lagae were separated from the surface of the culture by a glass fiber filter. Accumulation in the surface film partially explains previously reported losses when lipophilic pollutants were tested in aquatic systems. The accumulation mechanism in the surface film must be considered when water is sampled for organochlorine residue analysis. (See also W79-03842) (Lynch-Wisconsin)
W79-03866

ACCUMULATION OF LEAD BY SEVERAL GREEN ALGAE,
Staatsinstitut fuer Allgemine Botanik, Botanischer Garten und Anzuchtgarten Fuhlsbuettel, Hamburg (Germany, F.R.).
A. Weber, M. Melkonian, D. W. Lorch, and M. Wettern.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 254-260. 2 fig, 3 tab, 22 ref.

Descriptors: *Chlorophyta, *Absorption, *Bioaccumulation, *Lead, *EDTA, *Food chains, *Toxicity, *Heavy metals, Desorption, Pediastrum tetras, Pediastrum boryanum, Pediastrum duplex, Fritischiella tuberosa, Chlorella pyrenoidosa, Pollutants, Water pollution effects, Algae, Ions, Metabolism, Light, Oxygen.

Three species of Pediastrum (P. tetras, P., boryanum, and P. duplex) did not accumulate significant amounts of lead when treated with Pb-EDTA, but Chlorella pyrenoidosa concentrated the metal at a factor of 2800 and Fritschiella turberosa at a factor of 120. Of the lead accumulated, 85-95% could be desorbed by treatment with 0.001 M sodium-EDTA solution. Lead concentration by C. pyrenoidosa from Pb-EDTA was oxygen-dependent and was enhanced by light. The Pediastrum species concentrated lead at factors of 1700-7000 when applied in the ionic form $Pb(\quad)$. Chlorophyta thus show considerable variation in lead-concentrating capability; the algae investigated will be incorporated into a model food chain to study possible toxic accumulations at higher trophic levels. Lead concentration from Pb-EDTA may be due to either metabolic processes of the algae or to physico-chemical instability of the complex in the culture media used. The three Pediastrum species were cultured axenically in a modified Bold Basal Medium, and the other two species in a mineral medium according to Kessler and Czygan (1970). Aqueous stock solutions of lead (II) nitrate (pH 1) and lead-EDTA at 1 mg Pb/ml) were used; lead was added to the culture media either before or after autoclaving at 1 mg Pb/ml. In desorption experiments, lead-treated algae were harvested by a continous-flow centrifuge, washed, and inoculated into the sodium-EDTA solution. (See also W79-03842) (Lynch-Wisconsin)
W79-03867

N-UPTAKE AND PIGMENTATION OF N-LIMITED CHEMOSTAT CULTURES AND NATURAL POPULATIONS OF OSCILLATORIA AGARDHII,
Amsterdam Univ. (Netherlands). Lab. for Microbiology, Amsterdam (Netherlands).
W. Zevenboom, and L. R. Mur.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. International Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 261-274. 5 fig, 3 tab, 29 ref.

Descriptors: *Oscillatoria agardhii, *Pigments, *Nitrogen, *Limiting factors, *Eutrophication, *Absorption, Lakes, Netherlands, Wolderwijd(Netherlands), Veluwemeer(Netherlands), Algae, Cyanophyta, Nutrients, Bioassay, Light, Plant growth, Growth rates, Half-saturation constant, Plant physiology, Kinetics, Nitrates, Succession.

Experiments with the cyanophyte oscillatoria agardhii in chemostate and natural populations taken from two shallow, eutrophic Dutch lakes (Wolderwijd and Veluwemeer) in summer and fall of 1975-76 demonstrate that nitrogen, in addition to light, can become the limiting factor in eutrophic fresh waters. The experiments verified a hyperbolic relationship between nitrogen uptake rate and nitrogen concentration. The chemostat was particularly useful for investigation of relationship between limiting factors and algal succession. Conclusions: (1) the half-saturation constant for nitrate values of the cells varied progressively with the growth rate in the nitrate-limited chemostat cultures, and was therefore not a constat at all; (2) no variation in the ammonia half-saturation constant values was observed fo nitrate-and ammonia-limited cells; (3) the maximum uptake rate for nitrate and ammonia was a constant common value; (4) the observed lag time in nitrate uptake by nitrate-starved cells leads to a distinction between nitrate limitation and nitrate starvation (ammonia limitation); (5) pigmentation and nitrogen content of nitrogen-limited chemostate cultures was low compared with data for light-limited cells; (6) pigment and nitrogen content correlated positively with growth rate of the nitrogen-limited chemostate cultures, indicating good regulation of pigmentation and nitrogen content in response to changes in ambient nitrogen levels; and (7) nitrate-limited cells have higher pigment content than ammonia-limited cells. (See also W79-03842). (Lynch-Wisconsin)
W79-03868

TESTING OF SUBSTANCES FOR THEIR TOXICITY THRESHOLD: MODEL ORGANISMS MICROCYSTIC (DIPLOCYSTIS) AERUGINOSA AND SCENEDESMUS QUADRICAUDA,
Bundesgesundheitsamt, Berlin (Germany, F.R.) Inst. fuer Wasser-, Boden-, und Lufthygiene
G. Bringmann, and R. Kuhn
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandef-

jord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie. Mitteilungen No. 21, June 1978, p 275-284. 1 tab, 5 ref

Descriptors: *Microcystis aeruginosa, *Scenedesmus quadricauda, *Toxicity, *Pollutants, *Water pollution effects, *Bioassay, *Testing procedures, Algae, Chlorophyta, Cyanophyta, Methodology, Inorganic compounds, Organic acids, Aliphatic esters, Aromatic esters, Alcohols, Bioindicators.

A chlorophyte (Scenedesmus quadricauda) and a cyanophyte (Microcystis aeruginosa) were selected as model algae to test relative inhibitory effects of 180 pollutants, including 20 inorganic compounds, 11 organic acids, 24 aliphatic and aromatic esters, and 22 alcohol. The minimum inhibitory concentration (toxicity threshold) of 60% of the pollutants was lower for Microcystis than for Scenedesmus. In seven cases toxicity threholds for Scenedesmus exceeded those for Microcystis by two logs, in 45 cases by one log, and in 56 cases by up to one log. In 42 cases (23%) toxicity thresholds were about equal for the two species, and in 30 cases (17%) thresholds were higher for Microcystis than for Scenedesmus. It is recommended that both organisms be used in pollutant bioassays. The species were chosen as characteristic of cyanophytes and chlorophytes. All substances tested are listed with the toxicity threshold in mg/l for each alga, together with the ratio between the two, with microcystis set at 1.0. In the experiments the cell multiplication inhibition test was used. Since cell multiplication involves the entire metabolism, the result is total coverage of damaging effects of a hazardous water pollutant upon algae, in contrast with inhibition tests based on special physiological processes. The procedure is briefly described. (See also W79-03843). (Lynch-Wisconsin)
W79-03869

ANATOXINS FROM CLONES OF ANABAENA FLOS-AQUAE ISOLATED FROM LAKES OF WESTERN CANADA,
Alberta Univ., Edmonton. Dept. of Botany
W. W. Carmichael, and P. R. Gorham
In: Symposium: Experimental Use of Algal Culture in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 285-295. 3 fig, 2 tab, 36 ref.

Descriptors: *Canada, *Lakes, *Anabaena flos-aquae, *Toxins, *Anatoxins, *Cyanophyta, *Poisons, *Livestock, *Stock water, Alberta(Canada), Saskatchewan(Canada), Algae, Toxicity, Lethal limit, Phytoplankton, Microcysis aeruginosa, Microcystin, Plant morphology

Investigation of several cases of algae poisoning of livestock and other animals over the past 15 years in lakes of Alberta and Saskatchewan, in western Canada, has resulted in isolation of four types of anatoxins (designated a-d) from clones of the cyanophyte Anabaena flos-aquae taken from blooms from six sources. These six blooms were: (1) Burton Lake, Saskatchewan, June 1961, type a; (2) Echo Lake, Saskatchewan, 1963, type b(S); (3) Buffalo Pound Lake, Saskatchewan, June 1965, type a(S); (4) Disney Lake, alberta, June 19721, type b; (5) Beaverhill Lake, Alberta, September 1972, type C; and (6) Bendig's Pond, Saskatchewan, August 1975, type d. The qualifier (S) indicates a variationproducing severe salivation and lachrymation. Axenic clones were obtained by repeated cloning using the method of Carmichael and Gorham (1974). Lethal limit and symptoms were determined using lyophilized cultures in mice, rats, and chicks. Photomicrographs of the anatoxins from the six clones are included. The anatoxins' minimum lethal doses for mice I.D sub min (i.p.m.) are 60 for types a-c, and 10 for type d. Mouse survival times were 4-5 min for type a, 8-12 min for type b, 1-2 hrs for type c, and 4-10 min for type d. Of effects indentified, three are most indicative of the different toxins: (1) longer survival time--type c; (2) opisthotonous--typs a and a(S)--which is characteristic of post-synaptic neuromuscular depolarization compouns; and (3) chromodacryorrhea (bloody tears)--type d--which is characteristic of anticholinesterase compounds. (See also W79-03842). (Lynch-Wisconsin)
W79-03870

THE BIOGEOGRAPHY OF HOT SPRINGS ALGAE THROUGH ENRICHMENT CULTURES,
Oregon Univ., Eugene. Dept. of Biology
R. W. Castenholz.
In: Symposium: Experimental Use of Algal Culture in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No. 21, June 1978, p 296-315. 5 fig, 1 tab, 28 ref

Descriptors: *Biogeography, *Algae, *Hot springs, *Cyanophyta, *Mastigocladus laminosus, *Cultures, HTF Mastigocladus, Synechococcus lividus, Oscillatoria terebriformis, Spirulina labyrinthiformis, Chloroflexus aurantiacus, Prokaryotes, Israel, Water temperature, Yellowstone Nation Park(WY), Wyoming, Oregon, Montana, Canada, Zaire, Alaska, Arkansas, Mexico, Central America, Japan, New Zealand, Iceland, Azores, Italy, Czechoslovakia, Greece.

Thermophilic blue-green algae were collected from hot springs in western Canada, the United States, Mexico and Central America, Japan, New Zealand, Iceland, the Azores, Italy, Czechoslovakia, Greece, Israel, Zaire, and Uganda to clarify some questions of distribution and dispersal. Thermophilic algae, those able to grow at constant temperatures of 45C or over, form a group of species with distinct global distribution limits. The only phototrophic organisms which grow in hot springs above about 45-50C and pH above 5.0 are cyanophytic algae and anoxygenic photosynthetic bacteria; both are prokaryotes. Dispersal is thought to involve simple airborne transport by insects and birds. Hot springs were systematically examined, live collections were studies microscopically, and selective or enrichment cultures were used for many of the specis, usually followed by unialgal or clonal isolations to permit detailed comparative studes. Enrichment conditions included high temperataure alone, high or low temperature combined with lack of fixed oxygen, media with ammonium nitrogen or a calcium carbonate sediment, and agar medium for motile forms. Mastigocladus laminosus was the most widespread species, easily confused with a high temperature form (up to 62-64C), designated HTF Mastigocladus, also widespread. Synechococcus lividus had lesser survival abilities, though it was not as restricted as the very sensitive oscillatoria terebriformis. Spirulina labyrinthiformis was conspicuously absent from Iceland, the Azores, and New Zealnd. (See also W79-03842). (Lynch-Wisconsin)
W79-03871

THE USE OF SELENASTRUM CAPRICORNUTUM BATCH CULTURES IN TOXICITY STUDIES,
Instituto di Ricerca Sulle Acque, Brugherio (Italy)
For primary bibliographic entry see Field 5A
W79-03872

EFFECTS OF RIVER DISCHARGE ON THE COASTAL PHYTOPLANKTON CYCLE,
Norwegian Fisheries Directoriate, Arendal, Statens Biological Station
E. Dahl.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereingung fur Theoretische und Angewandte Limnologie, Mittelungen No. 21, June 1978, p 330-341. 11 fig, 15 ref

Descriptors: *Fjords, *Frierfjord(Norway), *Skein River(Norway), *Discharge(Water), *Phytoplankton, *Eutrophication, *Thermal powerplants, Coasts, Algae, Rivers, Langesund Bay(Norway), Zooplankton, Norway, Primary productivity, Carbon radioisotopes, Baseline studies, Life cycles, Water pollution effects, Heated water, Cool water, Chlorophyll, Salinity, Brackish water

Studies of the phytoplankton cycle in the Frier jord on Norway's southeast coast February 197 August 1976 showed that cold freshwater d charge from the Skein River produces a patte distinct from that of the open coast. In the Frie jord there is a large summer phytoplankton ma mum, but no spring diatom bloom as is found March at the open coast. A transition zone b tween the Frierfjord and the coast tends to bo spring bloom and summer maximum. The summ maximum in the Frierfjord is due to discharge nutrients, higher temperatures, and longer upho ing of the surface layer. The lack of a spring blo is due to short upholding of the surface layer a low temperature, hwich contribute to low grow rates. Few or no phytoplankton species can rep duce themselves rapidly in water characterized sonstat salinity changes. The Skien River has annual mean water flow of 300 cu m/sec, initiates a surface current of brackish water n ning through the branched fjord system towa the coast. Heated cooling water from a propo thermal power plant would raise temperatures the brackish productive layer of the Frierfjord thereby increase production throuhout the y especially in spring. The heated discharge co probably be constructed to prolong the uphold of the backish layer, and waste heat could be u to improve the outer fjords for recreation. also W79-03842). (Lynch-Wisconsin)
W79-03873

EFFECTS OF DIFFERENT PROCESS WAST AND MAIN SEWER EFFLUENTS FROM PU MILLS ON THE GROWTH AND PROD TION OF ANKIISTRODESMUS FALCAT VAR. ACICULARIS (CHLOROPHYTA),
Jyvaskyla Univ. (Finland). Dept. of Biology
V. Eloranta
In: Symposium: Experimental Use of Algal tures in Limnology, 26-28 October 1976, San jord, Norway. Internationale Vereinigung Theoretische und Angewandte Limnologie. M lungen No. 21, June 1978, p 342-351. 4 fig, 2 tab ref

Descriptors: *Pulp wastes, *Sulfate pulp m *Sulfite pulp mills, *Water pollution effects, * icity, *Bioassay, *BMT test, Ankistrodesmus f tus var. acicularis, Algae, Phytoplankton, Chl phyta, Sewage disposal, Waste water disp Plant growth, Primary productivity, Testing cedures, Industrial wastes, Condensates, Liqu Acids, Alkalinity, Effluents, Bioindicators

Modified BMT tests (no autoclaving of efflu were more sensitive than algal bioassays in as ing effects of untreated cellulose industrial fluents on growth and production of the chl phyte Ankistrodesmus falcatus var. acicu Process wastes and main sewer effluents from sulfate and sulfite pulp mills were tested wastewaters, spent liquors were the most (with the basic black liquor from the sulfate mill more toxic than the spent acid sulfite liq followed by the condensates, the toxicity of w was due to relatively volatile organic sulfur pounds and to resin and fatty acids. The clo tion effluent was more inhibitory in the sulfate in te sulfahe fulfite mill, with the reverese tr the alkaline extraction effluent. The sulfite chl ation effluent stimulated alagal growth when ity was not a limiting factor. In bioassays, the main sewer effluents were most toxic, followe basic effluent from the sulfate second main s and acid effluent from the sulfite bleachery. T ity of the sulfite main sewer effluent was mainly to its acidity and volatile compound modified BMT tests basic wastewater from sulfate second main sewer inhibited algal g and production most strongly, even at 1% co tration. Chlorophyll-a content determination too insensitive for studying short-term e Carbon-14 was suitable for studying some effects, but test conditions must be carefully trolled. (See also W79-03842). (Lynch-Wisc W79-03874

WATER CHEMICAL ANALYSES AND/OR ALGAL ASSAY. -- SEWAGE EFFLUENT AND POLLUTED LAKE WATER STUDIES,
Uppsala Univ. (Sweden). Inst. for Physiological Botany.
For primary bibliographic entry see Field 5A.
W79-03875

THE USE OF NATURAL PHYTOPLANKTON POPULATIONS IN BIOASSAY,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5A.
W79-03876

USE OF LABORATORY CULTURES OF SELENASTRUM, ANABAENA AND THE INDIGENOUS ISOLATE SPHAEROCYSTIS TO PREDICT EFFECTS OF NUTRIENT AND ZINC INTERACTIONS UPON PHYTOPLANKTON GROWTH IN LONG LAKE, WASHINGTON,
Corvallis Environmental Research Lab., OR.
J. C. Greene, W. E. Miller, T. Shiroyama, R. A. Soltero, and K. Putnam.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 372-384. 13 fig, 2 tab, 15 ref.

Descriptors: *Long Lake(WA), *Zinc, *Bioassay, *Phytoplankton, *Bottle test, *Industrial wastes, Smelters, Domestic wastes, Selenastrum capricornutum, Anabaena flos-aquae, Sphaerocystis schroeteri, Cultures, Algae, Cyanophyta, Chlorophyta, Standing crops, Eutrophication, Heavy metals, Pollutants, Runoff, EDTA, Chelation, Nutrients.

The algal assay bottle test was a useful method of predicting indigenous phytoplankton standing crop in eutrophic Long Lake, Washington, an impoundment of the Spokane River polluted by domestic and smelter waste discharges. Conclusions from the 1974-75 studies: (1) Zinc is the dominant heavy metal affecting laboratory cultures of Selenastrum capricornutum grown in Long Lake waters. (2) Surface water runoff directly influences heavy metal concentrations in the lake. (3) Increased growth of Selenastrum and Anabaena flow-aquae in EDTA-spiked lake sample can be directly attributed to chelation of zinc. (4) Sphaerocystis schroeteri, the dominant chlorophyte isolated from the lake, produced its maximum yield without addition of EDTA; the indigenous phytoplankton standing crop is not adversely affected by the zinc. (5) Selenastrum maximum yield correlated well with naatural phytoplankton standing crop and chlorophyll-a as well as with the chemically analyzed limiting nutrient. (6) Indigenous phytoplankton standing crop was limited by the primary limiting nutrient content of ambient water (whether phosphorus or nitroen). (7) Phytoplankton biomass in the lake was limited by nitrogen 57% of the samples, and secondarily by phosphorus (3% of the samples). In the remaining samples the primary limiting nutrient could be determined. (8) Zooplankton grazing may have affected species dominance, but did not significantly affect algal standing crop. (See also W79-03842). (Lynch-Wisconsin)
W79-03877

THE APPLICATION OF CULTURE METHODS IN STUDIES OF THE ECOLOGY OF SMALL GREEN ALGAE,
University Coll. of North Wales, Bangor. School of Plant Biology.
For primary bibliographic entry see Field 5A.
W79-03878

THE USE OF SMALL, CONTINUOUS AND MULTISPECIES CULTURES TO INVESTIGATE THE ECOLOGY OF PHYTOPLANKTON IN A SCOTTISH SEA-LOCH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
C. J. Jones, P. Tett, A. C. Wallis, and B. J. B. Wood.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 398-412. 7 fig, 28 ref.

Descriptors: *Testing procedures, *Phytoplankton, *Loch Creran(Scotland), Ecology, *Experimental enclosures, *Methodology, *Laboratory equipment, Scotland, Algae, Skeletonema costatum, Eucampia zodiacus, Cerataulina pelagica, Cultures, Baseline studies, Lochs, Fjords, Model studies, Nutrients, Zooplankton, Grazing, Limiting factors, Nitrogen, Phosphorus.

Laboratory methods involving simple apparatus (20-liter glass jars) were used to study phytoplankton ecology in filtered water samples from Loch Creran, a sea-loch on Scotland's west coast. Earlier work in the loch itself was complicated by patchiness and water movement. The laboratory cultures were multispecific, continuous, and exposed to a natural illumination cycle. Nine experiments were carried out 1974-75, lasting 1-40 days. With use of a large inoculum, a phytoplankton population that was similar to natural populations in the loch could be grown in the culture vessels 5-30 days. Skeletonema coastatum grew well as expected, but Eucampia zodiacus and Cerataulina pelagica, typical of open water, also grew surprisingly well. A 'normal' population was maintained for the longest time with moderate nutrient enrichments coupled with dilution of about 0.2/day. The cultures were used to investigate nutrient status, cell division cycles, and microzooplankton grazing. Use of Droop's nutrient growth model (experiment H) suggested that nitrogen is more likely than phosphorus to control phytoplankton growth in Loch Creran. Culture inocula were taken from a depth of 2-4 m in the loch using 8-liter plastic bottles. A normal population was broadly defined as occurrence of typical sea-loch species, their growth in parallel with the same species in the loch, coherence of growth curves, and the maintenance of moderate diversity. (See also W79-03842) (Lynch-Wisconsin)
W79-03879

THE FERTILITY OF SOME NORWEGIAN INLAND WATERS ASSAYED BY ALGAL CULTURES,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W79-03880

SOME ASPECTS ON THE CLASSIFICATION OF NATURAL WATERS BY ALGAL ASSAYS (SGP), PRELUDE,
Helsinki Univ. (Finland). Dept. of Limnology.
For primary bibliographic entry see Field 5A.
W79-03881

PHOSPHORUS AVAILABILITY IN THREE STREAMS DURING STORM EVENTS: CHEMICAL ANALYSIS VS. ALGAL ASSAY,
Kent State Univ., Ohio. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W79-03882

MONITORING THE EFFECTS OF CHEMICAL AND BIOLOGICAL WASTE WATER TREATMENT IN SITU BY DIALYSIS CULTURES OF FRESHWATER ALGAE,
Bergen Univ. (Norway). Inst. for General Microbiology.
For primary bibliographic entry see Field 5A.
W79-03883

COMPETITION OF THE GREEN ALGA SCENEDESMUS AND THE BLUE-GREEN ALGA OSCILLATORIA,
Amsterdam Univ. (Netherlands). Lab. for Microbiology.
L. R. Mur, J. Gons, and L. Van Liere.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 473-479. 5 fig, 11 ref.

Descriptors: *Cyanophyta, *Chlorophyta, *Oscillatoria agardhii, *Scenedesmus protuberans, *Competition, *Light intensity, *Growth rates, *Limiting factors, Turbidity, Phytoplankton, Algae, Succession, Lake, Eutrophication, Plant growth, Phosphates, Turbidity, Shading.

Research about competition between the chlorophyte alga Scenedesmus protuberans and the cyanophyte Oscillatoria agardhii indicate that light is the most important factor regulating blue-green algal blooms. Light distribution in water is greatly influenced by phytoplankton shading; increased concentration of the limiting factor will increase turbidity and favor organisms adapted to low light intensities. Since in freshwater phosphate is the limiting factor, phosphate inputs would therefore stimulate cyanophyte growth. Turbidity is caused by suspended materials and phytoplankton; the latter is more important in most cases. Maximal growth rate (mu sub max) of Scenedesmus was found to be 1.58/day, much higher than that of Oscillatoria (0.864/day). The level of limiting incident light intensity for Oscillatoria is 25 W/sq m, and for Scenedesmus about 85 W/sq m. Scenedesmus' maximal growth rate range is 30-85 W/sq m, while for Oscillatoria the range is 6-25 W/sq m. At a light intensity lower than two W/sq m Oscillatoria reached a higher growth rate than Scenedesmus. Experimental results are compared to data for the Randmeren Lakes in the Netherlands, where the optimum layer of Scenedesmus was 5-14 cm, and of Oscillatoria was 16-28 cm. In these shallow lakes Scenedesmus growth is impossible at the extinction of 0.05 or higher by a shortage of energy, but Oscillatoria can grow under such conditions. (See also W79-03842) (Lynch-Wisconsin)
W79-03884

MODELING OF N- AND P- UPTAKE BY SCENEDESMUS ACUTUS, WITH REGARD TO TERTIARY TREATMENT OF DOMESTIC WASTE WATER,
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
H. R. E. Paelinck, and J. De Maeseneer.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 480-489. 4 fig, 15 ref.

Descriptors: *Scenedesmus acutus var. alternans, *Tertiary treatment, *Waste water treatment, *Nitrogen, *Phosphorus, *Nutrient removal, *Mathematical models, Algae, Phytoplankton, Chlorophyta, Model studies, Absorption, Equations, Domestic wastes, Nutrients, Nitrates, Phosphates.

A model of tertiary wastewater treatment using the chlorophyte alga Scenedesmus acutus var. alternans considers not only the nutrient removed by treatment but also its relationship to other nutrients. The model represents a practical rather than a physiological appraoch to nutrient removal. Nitrate and phosphate uptake was studied in semicontinuous cultures, renewed after 24 hrs growth. Cultures remained vigorous throughout the experiment. Results showed relationships among initial phosphorus and nitrogen concentrations, dry wt, residual phosphorus and nitrogen, and phosphorus and nitrogen uptake. In this model nutrient uptake is well-established within limits of the experimental design, and extrapolation to other conditions of temperature, illumination, cell concentration, etc. is not possible. Functional equations derived to determine the quantity of dry weight which must be produced to eliminate a certain amount of nutrient (nitrogen or phosphorus) are given graphically. At nitrogen uptake values over 20 ro phosphorus uptake values over 300 laboratory cultures have difficulty maintaining themselves. Additional treatment under such conditions would be necessary for complete nutrient removal. Carbon dioxide could also become limiting under field conditions. (See also W79-03842) (Lynch-Wisconsin)

W79-03885

RESEARCH ON THE TERTIARY TREATMENT OF SWINE MANURE BY MASS CULTURING OF ALGAE,
Ghent Rijksuniversiteit (Belgium) Lab. for Biological Research in Environmental Pollution.
For primary bibliographic entry see Field 5D.
W79-03886

APPLICATION OF ALGAL ASSAYS IN THE ENVIRONMENTAL EVALUATION OF NEW DETERGENT MATERIALS,
Proctor and Gamble Co., Cincinnati, OH. Environmental Safety Dept.
For primary bibliographic entry see Field 5A.
W79-03887

GROWTH EXPERIMENTS WITH MARINE PLANKTON ALGAE: THE ROLE OF 'WATER QUALITY' IN SPECIES SUCCESSION,
Oslo Univ (Norway) Dept of Marine Biology and Limnology.
E Paasche
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 521-526. 2 fig, 1 tab, 14 ref.

Descriptors: *Seasonal, *Succession, *Marine algae, *Water quality, *Oslofjord(Norway), *Bioassay, *Eutrophication, Algae, Phytoplankton, Plant growth, Metals, Salts, Limiting factors, Norway, Seasonal, Diatoms, Chrysophyta, Lauderia annulata, Skeletonema costatum, Thalassiosira nordenskioeldii, Water chemistry, EDTA, Nitrates, Phosphates, Silicates, Chelation, Fjords.

Experiments with cultures of three representative planktonic marine diatom species grown in seawater samples from the inner Oslofjord, Oslo, Norway and enriched with nitrate, phosphate, and silicate, did not support the hypothesis that phytoplankton succession is influenced by variations in water quality. The study suggests that the only variations in chemical properties of the water likely to influence succession are seasonal changes in inorganic nutrient salts, such as nitrate or silicate. There was no indication that substances inhibitory to diatom growth were produced by any algae in the highly eutrophic inner Oslofjord, despite the presence of several algal species which grew to high densities. Growth of the three species in the test cultures--the widespread Skeletonema costatum, the cold-water species Thalassiosira nordenskiodeldii, and the warm-water species Lauderia annulata--was not restricted to any particular season. For example, Skeletonema grew no faster in May-June, the normal period of abundance, than at other times. Addition of EDTA to the water did not improve diatom growth. Metals present in soluble form appeared to be adequately balanced by naturally occurring chelators; according to several authors water quality is largely determined by the degree of complexation of trace metals. (See also W79-03842) (Lynch-Wisconsin)
W79-03888

ALGAL TESTS USED TO STUDY THE CHEMICAL FACTORS REGULATING THE GROWTH OF PLANKTONIC ALGAE IN THE HELSINKI SEA AREA,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
For primary bibliographic entry see Field 5A.
W79-03889

RELATIONSHIP BETWEEN ALGAL PHOSPHORUS EXTRACTION AND WATER PHOSPHORUS CONCENTRATION,
FMC Corp., Princeton, NJ. Research and Development Center
J. Saldick, and S. E. Coleridge.
In: Symposium Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 547-554. 6 tab, 11 ref

Descriptors: *Soluble reactive phosphorus, *Phosphorus, *Algae, *Bioassay, *Absorption, *Ceratophyllum, Macrophytes, Nutrients, Phosphates, Streams, Lakes, Indiana, Connecticut, Illinois, New York, Oedogonium, Hydrodictyon, Cladophora, Selenastrum capricornutum, Chlorophyta, Aquatic plants, Plant growth, Bottle test, Water chemistry, Phytoplankton.

Algae and macrophytes were sampled in streams and lakes in New York, Connecticut, Indiana, and Illinois 1973-75 during an environmental studies program of FMC Corporation for analysis of soluble reactive phosphorus (SRO) content of plants and water. Cladophora, Oedogonium, Hydrodictyon, and Ceratophyllum gave good linear correlations between SRP extracted from the plants and SRP in the ambient water. The macrophyte Ceratophyllum yielded relatively more extracted SRP than did the algae. SRP concentrations in the water 1-2 weeks prior to harvesting affected the quantity of SRP extracted. SRP in the indigenous Cladophora varied with geographic location. Subsequent experiments included: (1) algal assays with the EPA bottle test using the chlorophyte Selenastrum capricornutum; (2) harvesting of Cladophora (Chlorophyta) June 1975 from streams in Erie County, New York, and relocating to phosphorus-rich or phosphorus-poor streams where they were suspended in nylon mesh bags 15 cm below the surface for 1-2 days to assess SRP uptake; and (3) harvesting of Cladophora from a low-phosphate stream in New York (less than five micrograms SRP/1) and transplanting to lakes in Indiana and central New York. Transplantation of phorphorus-poor Cladophora into phosphorus-rich streams for 24-48 hrs gave 0.1-2.0% extractable SRP. (See also W79-03842) (Lynch-Wisconsin)
W79-03890

THE ALGAL GROWTH POTENTIAL OF AN INLAND SALINE AND EUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology
L E Shubert
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No. 21, June 1978, p 555-574. 22 fig, 6 tab, 64 ref.

Descriptors: *Eutrophication, *Devil's Lake(ND), *Algal growth potential, *Limiting factors, *Nutrients, *Saline lakes, *Sewage disposal, North Dakota, Lakes, Nitrogen, Phosphorus, Bioassay, Chlorella, Chlorophyta, Cyanophyta, EDTA, Trace elements, Glucose, Organic matter, Alkalinity, Shallow lakes, Water level fluctuations, Water pollution effects, Salinity, Algae, Bioindicators, Culture media.

Algal growth potential and limiting nutrients were bioassayed in Devil's Lake, a saline, alkaline (pH 8-9), eutrophic, shallow (mean depth five meters) lake in northeastern North Dakota. Evaporation exceeds precipitation, causing water level fluctuations and changes in salinity. Surface water samples were collected bimonthly from nine stations in the 23,200-ha lake during 1974-75. Water chemistry was determined, and the chlorophyte Chlorella DL 7-24-01 was used in the bioassays with Devil's Lake medium, a synthetic nutrient medium formulated on the basis of lake water sample analysis. Algal growth was measured daily, and for limiting tests, cultures were spiked with one of eight nutrient combinations involving nitrogen as sodium nitrate, phosphorus as K_2HPO_4, a trace element mixture, EDTA, and glucose. Algal growth was highest July-August with maximum temperatures and solar radiation; cyanophyta were dominant, especially Microcystis aeruginosa and Aphanizomenon flosaquae. Overall growth averaged 1.91 cell doublings every 48 hrs August 1974 to August 1975. In spiked cultures, growth stimulation overall was statistically significant with EDTA alone, nitrogen/phosphorus, and all nutrients together except glucose. During July and August no additions stimulated growth. High nutrient levels in the lake are partially due to sewage inputs. (See also W79-03842) (Lynch-Wisconsin)
W79-03891

SORPTION AND CONCENTRATION OF TAXIC MINERALS BY MASS CULTURES OF CHLOROCOCCALES,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Dortmund (Germany, F.R.).
C J Soeder, H D Payer, K H Runkel, J Beine, and E. Briele
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. International Vereinigung fu Theoretische und Angewandte Limnologie, Mitte lungen No. 21, June 1978, p 575-584. 2 fig, 6 tab, 1 ref

Descriptors: *Sorption, *Lead, *Cadmium, *Pollutants, *Coelastrum proboscideum, *Scenedesmus acutus var. alternans, Chlorphyta, Poisons, Toxicity, Hydrogen ion concentration, Thailand, West Germany, Mass cultures, Cultures, Bioassay, Algae, Phytoplankton, Water pollution sources, Air pollution, Potable water, Fertilizers.

Lead and cadmium sorption by the green alga Coelastrum proboscideum was studied in laboratory and greenhouse cultures, and accumulation of several toxic minerals in the biomass of the chlorophyte Scenedesmus acutus var. alternans was compared under outdoor conditions in Bangkok, Thailand, and Dortmund, West Germany. Upon exposure to a medium containing 0.5-1.0 ppm lead at C, Coelastrum biomass contained 1400-2200 pp lead (dry wt) after a few hours. The sorption ra was reduced by lower temperature and high concentrations of calcium and magnesium in t medium, but not influenced by inhibitors of phot synthesis or phosphorylation. Cadmium sorptio potential was lower; growth in a medium conta ing 40 ppb cadmium resulted in a maximal conce tration in the alga of 25 ppm. Cadmium sorptio increased with pH. In the outdoor experimen (1972-73), Scenedesmus was grown in mass cu tures yielding 10-20 g dry matter/sq m/day. Ha vested material was dried, analyzed for lead, ca mium, mercury, antimony, selenium, tin, arsen and bromine, and the relative contribution of pollution, tapwater, and fertilizer was statistica determined. This method is suitable for evaluati a site's overall pollution load. The Dortmund d indicated arsenic and cadmium came mainly fr fertilizer; tapwater was the major source of b mine, mercury, and tin, and air pollution of le and antimony. (See also W79-03842) (Lynch-W consin)
W79-03892

THE ROLE OF NUTRIENT COMPETITION A PREDICTIVE THEORY OF PHYTOPLAN TON POPULATION DYNAMICS,
Minnesota Univ., St. Paul Dept of Ecology a Behavioral Biology
D. Tilman.
In: Symposium: Experimental Use of Algal C tures in Limnology, 26-28 October 1976, Sand jord, Norway. Internationale Vereinigung Theoretische und Angewandte Limnologie, Mi lungen No 21, June 1978, p 585-592. 1 fig, 25

Descriptors: *Phytoplankton, *Population dyna ics, *Silicates, *Limiting factors, *Monod equati *Competition, *Model studies, Algae, Cyclot meneghiniana, Asterionella formosa, Forecasti Mathematical models, Lakes, Great Lakes, L Michigan, Diatoms, Chrysophyta, Half-saturat constant, Plant growth, Growth rates, Nutrie Plant physiology, Equations.

Previous work utilizing the Monod physiolog model of species competition for a nutrient is tended to help develop a more general theory phytoplankton population growth. Experim measuring competition for phosphate and sili by the diatoms Asterionella formosa and Cy tella meneghiniana showed little difference maximal growth rate, but results showed that

formosa was significantly better than C. meneghiniana at growing under phosphate limitation while the reverse was true under silicate limitation. That is, A. formosa had a significantly lower half saturation constant for phosphate-limited growth, and C. meneghiniana for silicate-limited growth. The Monod model was remarkably accurate in predicting the outcome of the two species grown together at various supply ratios of silicate and phosphate. Asterionella was dominant where both species were phosphate limited, Cyclotella was dominant where both species were silicate-limited, and coexistence was stable where each was limited by a different nutrient. Relative abundance of the two species in Lake Michigan along a natural gradient of silicate and phosphate was then predicted, assuming steady-state concentrations of extracellular nutrients. Four additional factors may affect species distribution: (1) nutrient physiology of major species, (2) nutrient supply rates, (3) species-specific mortality rates, and (4) physical factors such as temperature, light, pH, and major ions. (See also W79-03842) (Lynch-Wisconsin)
W79-03893

CHANGES IN SUCCESSION RATE IN A NATURAL PHYTOPLANKTON COMMUNITY FOLLOWING NUTRIENT ENRICHMENT,
Stockholm Univ. (Sweden). Inst. of Botany.
L. Tinnberg.
In: Symposium: Experimental Use of Algal Cultures in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen No 21, June 1978, p 593-599. 4 fig, 9 ref.

Descriptors: *Nutrients, *Eutrophication, *Brunnsviken(Sweden), *Phytoplankton, *Succession, *Limiting factors, *Succession rates, Algae, Sweden, Baltic Sea, Bays, Water pollution effects, Sewage disposal, Diversion, Brackish water, Forecasting, Nitrates, Phosphates, Species composition, Batch cultures, Oscillatoria agardhii, Cyanophyta.

Calculation of the phytoplankton succession rate 1973-75 in Brunnsviken, a small, isolated, brackish bay of the Baltic Sea in Stockholm, Sweden, showed one minimum during the spring bloom in April, and another beginning in June-July caused by a bloom of the cyanophyte Oscillatoria agardhii. Succession rates calculated from laboratory cultures can be used to predict effects of changes in nutrient levels on natural phytoplankton populations during summer stagnation. Depletion of nitrate and phosphate occurred during the cyanophyte bloom, and addition of these nutrients increased succession rates from July-October. From November-February the succession rate was high both under natural conditions and in batch cultures, making it difficult to evaluate the effect of enrichments by calculating succession rates. Sewage effluents were diverted from the bay in 1969, and during the summer stagnation of 1974 phosphate and nitrogen depletion reached limiting levels for some phytoplankton for the first time since diversion. Succession rate was used in this study as a measure of the rate of change in phytoplankton species composition. Samples were collected from a depth of 0.5 m with a 1.5-liter Ruttner sampler approximately biweekly, phytoplankton were counted, and total volumes were calculated for each species. To determine the limiting nutrient, batch culture tests were carried out on natural phytoplankton sampled biweekly. (See also W79-03842) (Lynch-Wisconsin)
W79-03894

COHO SALMON (ONCORHYNCHUS KISUTCH) AND HERRING GULLS (LARUS ARGENTATUS AS INDICATORS OF ORGANOCHLORINE CONTAMINATION IN LAKE ONTARIO,
Canadian Wildlife Service, Ottawa (Ontario). Wildlife Toxicology Div.
For primary bibliographic entry see Field 5A.
W79-03895

CORRELATIONS BETWEEN SPECIFIC ALGAE AND HEAVY METAL BINDING IN LAKES,
Ottawa Univ. (Ontario). Dept. of Biology.
F. Briand, R. Trucco, and S. Ramamoorthby.
Journal of the Fisheries Research Board of Canada, Vol 35, p 1482-1485, 1978. 1 fig, 2 tab, 16 ref.

Descriptors: *Heavy metals, *Diatoms, *Chlorophyta, *Mercury, *Copper, *Lead, *Cadmium, Biomass, Phytoplankton, Nutrients, Physicochemical properties, Water chemistry, Chemical analysis, Phosphates, Aquatic algae, *Bioaccumulation.

Long-term experiments conducted at Heney Lake, Quebec, show the binding capacity for the metal ions Cu2+, Hg2+, Pb2+, and Cd2+ to be related to algal species composition rather than to total algal biomass or physicochemical parameters. Most of the binding could be accounted for by certain species of green algae, diatoms, and chrysomonads that usually constituted only a minor fraction of the total algal volume. (EIS-Deal)
W79-03896

CULTURE STUDIES ON THE EFFECTS FROM FLUORIDE POLLUTION ON THE GROWTH OF MARINE PHYTOPLANKTERS,
British Columbia Univ., Vancouver (British Columbia). Dept. of Botany.
L. Oliveira, N. J. Antia, and T. Bisalputra.
Journal of the Fisheries Research Board of Canada, Vol 35, p 1500-1504, 1978. 1 fig, 1 tab, 21 ref.

Descriptors: *Growth rates, *Fluorides, *Toxicity, Diatoms, Dinoflagellates, Phytoplankton, Inhibition, Metabolism, Water chemistry, Water analysis, Chemical analysis, Industrial wastes, Nutrients, Salinity, Sea water, Marine phytoplankton.

The autotrophic growth of 12 species of marine phytoplankters, from eight classes of algae, was tested on axenic cultures with NaF additions of 0-100 mg F/L. All species showed good growth without indication of toxicity or adaptation lag. The highest fluoride concentration caused 25-30% growth-rate inhibition of a diatom, a dinoflagellate, and a haptophyte; other diatoms and species from other classes of algae were virtually unaffected. It is hypothesized that the unexpected lack of toxicity from F- ion may be due to the formation of innocuous complexes with one or more ions of seawater. The ecological inference is drawn that fluoride pollution may be readily tolerated by some marine phytoplankton under nutrient-sufficient conditions. (EIS-Deal)
W79-03897

A STEADY-STATE PHYTOPLANKTON MODEL OF CHESAPEAKE BAY,
Hydroscience, Inc., Westwood, NJ.
H. J. Salas, and R. V. Thomann.
Journal Water Pollution Control Federation, Vol. 50, p. 2752-2770, 1978. 15 fig, 2 tab, 8 ref.

Descriptors: *Model studies, *Mathematical models, *Phytoplankton, *Chesapeake Bay, Eutrophication, Chlorophyll, Biomass, Nutrients, Nitrogen, Phosphorus, Growth rates, Productivity, Municipal wastes, Water quality, Water chemistry, *Susquehanna River.

A quasi-linearized, steady-state model of nutrient-phytoplankton interactions is constructed for the Chesapeake Bay system to provide a first basis for allocation of nutrient discharges. The results of the data and model evaluations indicate that phosphorus is more important than nitrogen in limiting phytoplankton growth in the Chesapeake Bay proper above the Potomac River. The most significant sources of nutrients to the bay are from the Baltimore metropolitan area and the Susquehanna River. First estimates of the reaction coefficients were obtained from approximation to the nonlinear theory and then further refined using the two years of data. Estimates of the impact on phytoplankton biomass, as measured by chlorophyll a, as a result of reduced phosphorus discharges are determined from the model for different regions of the bay (EIS-Deal)
W79-03899

LYSOSOMAL RESPONSES TO EXPERIMENTALLY INJECTED ANTHRACENE IN THE DIGESTIVE CELLS OF MYTILUS EDULIS,
Institute for Marine Environmental Research, Plymouth (England).
M. N. Moore, D. M. Lowe, and P. E. M. Fieth.
Marine Biology, Vol. 48, p. 297-302, 1978. 1 fig, 2 tab, 17 ref.

Descriptors: *Cytological studies, *Toxicity, *Mussels, Animal physiology, Animal metabolism, Aromatic compounds, Chemical analysis, Biochemistry, Enzymes, Digestion, Commercial shellfish, *Anthracene, *Tissue analysis, Mytilus, *Lysosomes.

Experimentally injected anthracene has been shown to induce dose-dependent lysosomal destabilisation and release of hexosaminidase in the digestive cells of Mytilus edulis after 24 h. This destabilisation was accompanied by cytological evidence of cytolysis of the digestive cells. The destabilising effect of 100 microgram of onjected anthracene persisted for 96 h with a return to the control condition by 168 h. These results are discussed in the content of environmental contamination by polycyclic aromatic hydrocarbons. (EIS-Deal)
W79-03900

237PU EXPERIMENTS WITH THE PLAICE PLEURONECTES PLATESSA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath.
Marine Biology, Vol. 48, p. 327-335, 1978. 5 fig, 6 tab, 13 ref.

Descriptors: *Radioisotopes, *Isotope studies, *Fish physiology, Radioactivity, Radioecology, Radioactive wastes, Tracers, Animal metabolism, Digestion, Absorption, Crabs, Path of pollutants, Growth stages, Chemical analysis, Radiochemical analysis, *Plutonium, *Paice, Pleuronectes, *Tissue analysis, *Bioaccumulation.

Several experiments have been performed on the metabolism of 237Pu - a high specific activity, gamma-emitting isotope of plutonium - by the plaice Pleuronectes platessa. Very little of the isotope was incorporated into fish after 2 months exposure to labelled water. The oral retention from a variety of labelled foods was also very poor, and apart from the gut itself no incorporation of the isotope could, in fact, be demonstrated. Injected 237Pu was eliminated very slowly, and some evidence was obtained for an inverse relationship between the rate of 237Pu loss and the rate of growth of the fish. Growing fish incorporated a relatively larger fraction of the 237Pu body burden into skeletal material, and this was attained at the expense of the isotopic content of the liver. Very little 237Pu was incorporated into muscle. (EIS-Deal)
W79-03901

THE IMPORTANCE OF THE TIME FACTOR IN THE RESPONSE OF ZOOPLANKTON TO VARYING CONCENTRATIONS OF NATURALLY OCCURRING PARTICULATE MATTER,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
P. Mayzaud, and S. A. Poulet
Limnology and Oceanography, Vol 23, No 6, p 1144-1154, 1978. 7 fig, 1 tab, 37 ref.

Descriptors: *Food habits, Model studies, *Copepods, *Food abundance, Mathematical models, Zooplankton, Animal behavior, Feeding rates, Animal populations, Food chains, Biomass, Enzymes, Biochemistry, Chemical analysis, Proteins, *Pseudocalanus, *Tissue analysis, Particulate matter

Over the course of a year a linear relationship was found between feeding rates of five species of neritic copepods and their probable food supply, the naturally occurring particulate matter. However, a saturation-type curve was obtained when a range of food concentration was offered to Pseudocalanus minutus over a short period of time (18-20h). Digestive enzyme levels of the copepod population were also found to vary linearly on a seasonal basis. The affinity appeared to vary with time, indicating acclimation in the digestive system. A new model, linear for variations of food concentrations over an extended period of time (weeks to a year) and curvilinear for variations over a time smaller than the one needed for acclimation, is developed. (EIS-Deal)
W79-03902

POLYCHLORINATED BIPHENYL (PCB) UPTAKE BY MARINE PHYTOPLANKTON.
Stanford Univ., Pacific Grove, CA. Hopkins Marine Station
I. W. Harding, Jr., and J. H. Phillips, Jr.
Marine Biology, Vol. 49, p. 103-111, 1978. 7 fig, 1 tab, 41 ref

Descriptors: *Polychlorinated biphenyls, *Phytoplankton, *Adsorption, Absorption, Toxicity, Photosynthesis, Growth rates, Inhibition, Aquatic populations, Biomass, Path of pollutants, Chemical wastes, Marine algae, *Freundlich adsorption isotherm

The time-courses of uptake for 2,4,5,2',5'-pentachlorobiphenyl (PCB) by 11 marine phytoplankton species were measured and found to be rapid, with equilibration occurring within 0.5 to 2.0 h. These data were described with the empirical Freundlich adsorption isotherm. The relationship between cell density and accumulation of PCBs was also investigated. Concentration factors on a volume per volume basis ranged from 1.23 x 10 to the 4th power to 2.41 x 10 to the 6th power for the 11 algal species examined. These values are comparable in magnitude to factors reported previously for phytoplankton in natural marine systems. (EIS-Deal)
W79-03903

POLYCHLORINATED BIPHENYLS: ACCUMULATION FROM CONTAMINATED SEDIMENTS AND WATER BY THE POLYCHAETE NEREIS DIVERSICOLOR.
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum
S. W. Fowler
Marine Biology, Vol 48, p 303-309, 1978. 4 fig, 20 ref

Descriptors: *Polychlorinated biphenyls, *Absorption, Sediments, Worms, Water chemistry, Animal metabolism, Animal physiology, Chemical analysis, Gas chromatography, Path of pollutants, Chemical wastes, Benthic fauna, *Tissue analysis, *Bioaccumulation, *Polychaetes, *Nereis, Depuration

Comparisons were made of the accumulation of a PCB mixture from sediments and from water by the benthic worm Nereis diversicolor. Uptake from sediments was dose-dependent, attaining equilibrium concentration factors of approximately 3 to 4 after 2 months. Subsequent PCB elimination rates were concentration-dependent, with higher initial loss rates evident in the worms containing higher levels of PCBs. Accumulation of PCBs from water was much more rapid; concentration factors reached approximately 800 after only 2 weeks. Estimates were made of the relative importance of sediments and water as a source of PCBs to worms exposed to these contaminants in the natural environment. Calculations based on experimentally derived PCB concentration factors and ambient PCB levels in sediments and water suggest that compared to water, sediments contribute the bulk of these compounds to the worms. The possible mechanisms involved in the uptake of sediment-associated PCBs are discussed. (EIS-Deal)
W79-03904

EFFECTS OF SEDIMENTS ON THE DEVELOPMENT OF MACROCYSTIS PYRIFERA GAMETOPHYTES.
University of Southern California, Los Angeles. Environmental Engineering Program
J. S. Devinny, and L. A. Volse
Marine Biology, Vol. 48, p. 343-348, 1978. 2 fig, 17 ref

Descriptors: *Sediments, *Growth stages, *Kelps, *Spores, Reproduction, Plant growth, Plant physiology, Benthic flora, Turbidity, Dredging, Sewage effluents, Sediment discharge, Mortality, Sedimentation rates, *Macrocystis

Rocky ocean bottoms are covered from time to time with small amounts of fine sediments. This material may interfere with the development of germling stage of Macrocystis pyrifera. Tests were performed by introducing sediments before and after spores were dispersed in culture dishes. 10 mg cm-2 of sediment, enough to occlude the surface, prevents spore attachment, greatly reducing the probability of survival. Smothering of established germlings was severe at 108 mg sediment cm-2. Water motion further reduced spore success where sediments were present, probably because of abrasive scour. Mechanisms of natural and human interference with M. pyrifera reproduction are suggested. (EIS-Deal)
W79-03905

PROCEEDINGS OF THE FIRST AND SECOND USA-USSR SYMPOSIA ON THE EFFECTS OF POLLUTANTS UPON AQUATIC ECOSYSTEMS-VOLUME I: DULUTH, MINNESOTA, USA SYMPOSIUM OCTOBER 21-23, 1975, VOLUME II: BOROK, JAROSLAVL OBLAST, USSR SYMPOSIUM JUNE 22-26, 1976.
Environmental Protection Agency, Grosse Ile, MI
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 219, Price codes: A18 in paper copy, A01 in microfiche. Report EPA-600/3-78-076, 412 p, 1978. Mount, D. I., W. R. Swain and N. K. Ivanikiw, eds.

Descriptors: *Conferences, *Ecosystems, *Aquatic environment, International symposiums, *USSR, Ecology, Aquatic populations, Fish populations, Toxicity, Water quality, Water quality control, Water quality standards, Bioassay, Fish physiology, Fish diseases, Fish parasites, Eutrophication, Trophic level, Productivity, Chemical wastes, Industrial wastes, Municipal wastes, Pesticide residues, Pesticide toxicity, *Symposium

The published papers from these symposia contain both broadly based review papers, designed to familiarize attendees with a wide cross-sectional representation of ecologically related activities in each country, and narrowly specific state-of-the-art scientific discussions. The presentations focus upon methodology, historical aspects, microbial and abiotic degradation processes, trace metal problems, effects of toxicants, proposed species indices, and studies of fate and transport of pollutants. (See W79-03907 thru W79-03940) (EIS-Deal)
W79-03906

PERMISSIBLE POLLUTION LEVELS OF WATER BODIES.
Moscow State Univ. (USSR). Dept. of Biology
For primary bibliographic entry see Field 5G
W79-03907

A BRIEF HISTORY OF WATER POLLUTION RESEARCH IN UNITED STATES.
For primary bibliographic entry see Field 5G
W79-03908

CHARACTERISTICS OF THE MOSCOW RIVER WATER QUALITY ACCORDING TO HYDROBIOLOGICAL INDICES.
For primary bibliographic entry see Field 5A
W79-03909

ENDPOINTS IN BIOASSAY.
For primary bibliographic entry see Field 5A
W79-03910

PHYSIOLOGICAL-BIOCHEMICAL ASPECT OF WATER TOXICOLOGY.
Tsentralnyi Nauchno-Issledovatelskii Inst. Osetr vogo Khozyaistva, Astrakhan (USSR)
For primary bibliographic entry see Field 5A
W79-03911

BIOENERGETIC AND OTHER CONSIDER ATIONS IMPORTANT IN THE STUDY O WATER QUALITY INFLUENCES ON FIS GROWTH.
P. Doudoroff
In: Proceedings of the First and Second USA USSR Symposia on the Effects of Pollutants Up Aquatic Ecosystems - Vol. 1, Environmental Pr tection Agency, Report EPA-600/3-78-076, p. 5 67, 1978. 12 ref

Descriptors: *Growth rates, *Toxicity, *Ener budget, Fish physiology, Animal metabolism, P sons, Energy, Energy conversion, Nutrients, C cling nutrients, Growth stages, Water pollut effects, Fish behavior, Food habits, Water te perature

To understand effects of environmental factors the growth of animals it is essential to consider what extent and to what ends the energy a materials of food consumed by the animals utilized and how they are distributed, under wh conditions, among portions having different fat A general procedure and several studies are p posed, based on important bioenergetic and e logical considerations, for efficient experimen investigation of undesirable effects on fish grow of water pollutants, especially toxic ones. (See a W79-03906) (EIS-Deal)
W79-03912

MONITORING THE CONDITION OF FLO ING WATERS BY BIOLOGICAL ORANISM
For primary bibliographic entry see Field 5A
W79-03913

THE ROLE OF ALGAE IN THE POLLUTI OF RESERVOIRS AND PROBLEMS OF CO TROLLING THEIR NUMBERS.
Moscow State Univ. (USSR)
V. G. Khobotev
In: Proceedings of the First and Second US USSR Symposia on the Effects of Pollutants U Aquatic Ecosystems - Vol. 1, Environmental P tection Agency, Report EPA - 600/3-78-076, p. 86, 1978. 4 ref.

Descriptors: *Eutrophication, *Phytoplank *Algicides, *Algal control, Reservoir operat Reservoirs, Water supply, Nutrients, Chem analysis, Water quality, Water treatment, Cya phyta, Filtration, Chlorination, Mollusks, Daph Photosynthesis, Monuron, Biocontrol, *Diuron

In some polluted waters, with nutrient enrichm and slightly increased temperature, favorable ditions are created for massive developmen algae. The enhanced growth of phytoplankton ates a considerable nuisance in water supp since it often disturbs treatment processes and pairs the quality of water produced. Biolog mechanical, physical and chemical methods of trolling algal blooms are compared. No method is best and there should be several methods for specific purposes for each water b (See also W79-03906) (EIS-Deal)
W79-03914

EUTROPHICATION IN THE UNITED STA PAST-PRESENT-FUTURE.
For primary bibliographic entry see Field
W79-03915

DETERMINING THRESHOLD AND BIOLOGICALLY DANGEROUS CONCENTRATIONS OF BLUE-GREEN ALGAE IN WATER BODIES,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. A. Sirenko, A. Ya. Malyarevskaya, and T. I. Birger.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 105-114, 1978. 4 tab, 8 ref.

Descriptors: *Cyanophyta, *Toxicity, *Fish physiology, Eutrophication, Growth rates, Photosynthesis, Algal toxins, Water chemistry, Nutrients, Metabolism, Animal metabolism, Mortality, Vitamins, Animal pathology, Amino acids, Biochemistry, Zooplankton, Algae, *Tissue analysis.

It is important to remember that biologically dangerous concentrations of blue-green algae may change, depending on the effect of the algae's natural metabolites and synergism or antagonism with other biotic or abiotic water substances. In particular, the toxicity of blue-green algae will depend both on a series of chemical indices (temperature effect, content of oxygen in water, carbon dioxide, the presence of salts of such metals as manganese, zinc and lithium) and on the physiological state of algae cells (living, dead, decomposing). Thus, in our experiments, decomposing algae proved to be more toxic for fish. (See also W79-03906)(EIS-Deal)
W79-03916

TOXIC ORGANIC RESIDUES IN FISH,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5A.
W79-03917

BALANCE OF ORGANIC MATTER IN THE ECOSYSTEM OF THE RYBINSKIY RESERVOIR,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
V. I. Romanenko.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 121-131, 1978. 3 fig, 3 tab, 10 ref.

Descriptors: *Reservoirs, *Organic matter, *Nutrients, Productivity, Primary productivity, Trophic level, *Ecosystems, Phytoplankton, Photosynthesis, Chemical oxygen demand, Bacteria, Biomass, Plant growth, *Rybinskia Reservoir(USSR).

Detailed data is presented on the main elements which contribute or withdraw organic matter from the reservoir. The relative contribution of each element is assessed and the difference between input and expenditure or organic matter is computed. (See also W79-03906) (EIS-Deal)
W79-03918

THE IMPORTANCE OF TROPHIC BONDS IN THE BACTERIAL DESTRUCTION OF ORGANIC MATTER,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
P. P. Umorin.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p. 132-151, 1978. 11 fig, 2 tab, 18 ref.

Descriptors: *Protozoa, *Bacteria, *Organic matter, Water purification, Mathematical models, Growth rates, Model studies, Nutrients, Nitrogen, Biomass, Phenols, Trophic level, Predations, Cycling nutrients, Food chain, Waste assimilative capacity.

The interrelations of bacteria and protozoa in the rate of decomposition of organic matter is studied. Bacteria are the main consumer of organic matter in water bodies. Zooflagellates cannot affect the rate of decomposition of dissolved organic matter. As for infusoria, they can notably slow down the decomposition or organic matter by bacteria by means of reducing their number due to predation. However, in water bodies, as a rule, a deficiency in nutrients has been observed. Guaranteeing their recycling, infusoria may accelerate the bacterial destruction of organic matter. (See also W79-03906) (EIS-Deal)
W79-03919

SIMULATION OF POTENTIAL POLLUTANT-CAUSED CHANGES IN THE ECOSYSTEM, RESULTING FROM THE SENSITIVITY OF AQUATIC ORGANISMS TO TOXICANTS,
Moscow State Univ. (USSR). Faculty of Biology.
N. S. Stroganov.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 152-160, 1978. 2 fig., 1 tab.

Descriptors: *Simulation analysis, *Toxicity, Bioassay, Chemical properties, Growth rates, Laboratory tests, Ecosystems, Aquatic environment, Resistance, Daphnia, Bacteria, Algae, Chlorella, Scenedesmus, Anabaena, Mollusks, Worms, Diptera, Water Pollution effects, Path of pollutants, *Salicylanilide.

It is possible to simulate a complex ecosystem using a small volume, in which there are all of the basic cmponents characteristic of natural aquatic communities. However, such a simulation is expensive, very time-consuming, ad requires the equipping of a large experimental base. Another means of simulations could be based on laboratory tests and conducted according to a definite plan using representative organisms from basic functional groups which take part in the cycling of materials and of organisms which are of interest to industry. A representative experiment examining th toxicity of salicylanilide is presented. (See also V79-03906) (EIS-Deal)
W79-03920

FISH-POPULATION STUDIES IN THE OHIO RIVER,
W. C. Klein.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 161-165, 1978. 5 ref.

Descriptors: *Fish populations, *Ohio River, Fish establishment, Commercial fishing, Sport fishing, Channel improvement, Locks, Fish barriers, Water pollution effects, Canal construction, Carp, Municipal wastes, Industrial wastes, Flow control, Flow rates, Reservoirs, Canals, *Species diversity.

A review of historical and recent information concerning fish in the Ohio River during 1957-60 and 1968-70 indicates that the composition of the fish population has changed during the period. In large measure, the changes can be attributed to the canalization of the river and increased pollution load. Although the pollution load has been decreased in recent years by the installation and operation of wastewater control facilities, the lake-like setting of the Ohio River continues to influence the kinds and numbers of fish in the river, as evidenced by the chemical fishing studies performed in the lock chambers. Although many of the so-called sport and commercial speicies have returned to the river, the fish species desiring a lake-like setting continue to dominate the populations. (See also W79-03908) (EIS-Deal)
W79-03921

REGISTRATION OF PESTICIDES: CONSIDERATIONS IN CONDUCTING AQUATIC TOXICITY TESTS,
For primary bibliographic entry see Field 5A.
W79-03922

EXPERIMENTAL RESEARCH ON PHENOL INTOXICATION OF AQUATIC ORGANISMS AND DESTRUCTION OF PHENOL IN MODEL COMMUNITIES,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
M. M. Kamshilov, and B. A. Flerov.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 181-192, 1978. 3 fig, 1 tab, 2 ref.

Descriptors: *Phenols, *Toxicity, Bacteria, Resistance, Chlorophyta, Chlorella, Diptera, Daphnia, Organic Compounds, Chemical reactions, Fertility, Fish reproduction, Fish behavior, Trout, Growth stages, Fish physiology, Model studies, Microbial degradation.

In the first part of the investigation, some particular and general problems of aquatic toxicity have been studied on a model of phenol intoxication of aquatic organisms. Among the problems investigated were comparative resistance of aquatic organisms, the role of biotic and abiotic factors in determining, resistance effects of different concentrations of the toxicant on biological and physiological processes of auatic organisms, and ability of organisms to adapt. In the second part of the investigations, destruction of phenol in different model ecosystems has been studied. (See also W79-03906) (EIS-Deal)
W79-03923

HISTORY OF CHANGES IN FISH SPECIES OF THE GREAT LAKES,
J. F. Carr.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p. 193-218, 1978. 3 fig., 9 tab., 27 ref.

Descriptors: *Great Lakes, *Fish populations, Lake Erie, Lake Huron, Lake Superior, Lake Michigan, Lake Ontario, Industrial wastes, Chemical wastes, Municipal wastes, Productivity, Trophic level, Nutrients, Spawning, Biological communities, Lampreys, Salmonids, DDT, Pesticide residues, Phytoplankton, Zooplankton, Water quality, Water quality control, *Species diversity, *Tissue analysis.

The purpose of this paper was to discuss the changes which have taken place in the fish populations of the Great Lakes and the stresses which have caused these changes. The stresses which have been placed on the fish communities of the Great Lakes have been sequential and reflect and progress of man's occupation of the basin and his technological development. Physical, biological, chemical and thermal alterations, including exploitation, destruction of spawning grounds, oxygen depletion, increased water temperature, change in available food, and competition with introduced species, are discussed. (See also W79-03906) (EIS-Deal)
W79-03924

SEA LAMPREY (PETROMYZON MARINUS LINNAEUS) IN THE SAINT LAWRENCE GREAT LAKES OF NORTH AMERICA: EFFECTS, CONTROL, RESULTS,
C. M. Fetterolf, Jr.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p. 219-226, 1978. 6 fig., 5 ref.

Descriptors: *Lampreys, *Great Lakes, *Commercial fishing, *Fish parasites, Lake Erie, Lake Superior, Lake Huron, Lake Michigan, Lake Ontario, Pesticides, Parasitism, Lake Trout, Bioassay, Pest control, Fish populations, *Lampricides, *TFM, *Bayer 73.

This paper outlines the history of the sea lamprey's existence in the Great Lakes Basin. Topics dis-

cussed include: life cycle; effects on commecial fishing; and efforts to develop an effective control program. (See also W79-03906) (EIS-Deal)
W79-03925

TOXICITY TESTS IN THE REGULATION OF WASTE DISCHARGES IN THE UNITED STATES,
For primary bibliographic entry see Field 5A.
W79-03926

TOXICOLOGICAL CONTROL OF POLLUTION OF FRESHWATERS,
Moscow State Univ. (USSR). Faculty of Biology.
For primary bibliographic entry see Field 5A.
W79-03927

TOXICITY OF EXPERIMENTAL FOREST INSECTICIDES TO FISH AND AQUATIC INVERTEBRATES,
For primary bibliographic entry see Field 5A.
W79-03928

PRINCIPLES AND METHODS OF BIOLOGICAL ESTABLISHMENT OF THE NORMS OF CHEMICAL SUBSTANCES AND EVALUATION OF THE LEVEL OF POLLUTION IN WATER-BODIES,
Tsentralnyi Nauchno-Issledovatelskii Inst. Osetrovog Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5G.
W79-03929

CHRONIC EFFECTS OF LOW LEVELS OF HYDROGEN CYANIDE ON FRESHWATER FISH,
L. L. Smith, Jr.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p 39-54, 1978. 3 fig., 8 tab., 6 ref.

Descriptors: Bioassay, *Toxicity, Mortality, *Minnows, *Brook trout, *Hydrogen cyanides, Laboratory tests, Methodology, *Cyanide toxicity, Water pollution effects, Industrial wastes, Growth rates, Growth stages, Chronic toxicity, Juvenile fish, Fecundity, Reproduction, Threshold concentration.

Chronic exposure tests of fathead minnows and brook trout indicates that safe level of HCN in the envronment are much lower than the concentrations which will kill fish in short exposure. When there is continuous exposure of low levels of cyanide, some fish populations may be adversely affected by concentrations greater than 7-12 ug/liter. (See also W79-03906) (EIS-Katz)
W79-03930

MICROBIOLOGICAL INDICES OF THE QUALITY OF WATER AND METHODS OF THEIR DETERMINATION,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5A.
W79-03931

AMMONIA AND NITRITE TOXICITY TO FISHES,
R. C. Russo, and R. V. Thomann.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p 75-82, 1978. 1 tab., 44 ref.

Descriptors: *Ammonia, *Nitrogen compounds, Nitrogen cycle, Sewage treatment, Toxicity, Mortality, Bioassay, Aquiculture, *Water pollution effects, Rainbow trout, Freshwater fish reviews, Laboratory tests, Aqueous ammonia liberation system, *Nitrites.

The literature regarding the toxicity of unionized ammonia and nitrites to fish is review critically. (See also W79-03906) (EIS-Katz)
W79-03932

A RESEARCH SYSTEM FOR DEVELOPING FISHERIES STANDARDS FOR WATER QUALITY, CONSIDERING THE PECULIARITIES OF TRANSFERRING EXPERIMENTAL DATA TO NATURAL WATER BODIES,
For primary bibliographic entry see Field 5G.
W79-03933

COLLAGEN AND HYDROXYPROLINE IN TOXICOLOGICAL STUDIES WITH FISHES,
F. L. Mayer, and P. M. Mehrle
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 92-101, 1978. 1 fig, 4 tab, 26 ref.

Descriptors: *Fish physiology, *Biochemistry, *Protein, *Enzymes, Water pollution effects, Animal pathology, Chlorinated hydrocarbon pesticides, Insecticides, Toxaphene, *Collagen, *Hydroxyproline, Toxicity, Toxicological studies, Growth, Bone development, Backbone development, *Collagen formation, Vitamin C

Biochemical characteristics such as hydroxyproline ad collagen concentrations in bone can be used as indicators, and within limits, predicors of growth in fish thereby shortening chronic toxicity tests. Although growth can be directly related to collagen and hydroxyproline metabolism in fish, the mechanism by which growth is reduced is not known. Other biochemical processes requiring vitamin C could also be affected when large amounts of the vitamin are used by the liver in detoxication of organic contaminants through microsomal hydroxylative enzmes. (See also W79-03906) (EIS-Katz)
W79-03934

EXPERIMENTAL TESTING OF TOXICITY OF WATER MEDIA AND INCREASING OF THE SENSITIVITY OF BIOLOGICAL TESTS,
For primary bibliographic entry see Field 5A
W79-03935

CHRONIC EFFECTS OF LOW LEVELS OF HYDROGEN SULFIDE ON FRESHWATER FISH,
L. L. Smith, Jr.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of the Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 113-121, 1978. 6 tab., 8 ref.

Descriptors: *Hydrogen sulfide, *Toxicity, Mortality, Bioassay, Fresh water fish, Laboratory test, *Toxic concentrations, Chronic effects, Brook trout, Bluegill sunfish, Fathead minnow, Goldfish, Threshold toxicity, Growth aquiculture, LC50

Comparison of LC50 levels of hydrogen sulfide with those which have adverse effects after long exposure indicates that the 96-hr LC50 may be 3 to 8 times higher than the safe levels. The present work, and that of Smith and Oseid (1974), who examined the effect of hydrogen sulfide on early life history stages of 8 species of freshwater fish, slow that a safe level of hydrogen sulfide which will insure survival and growth of a fish population, and adequate survival of all life history stages will generally be between 0.002 and 0.004 mg/1 at 20 degree C. In bluegills, the level is significantly lower, and this pattern may be followed in other species not rested. (See also W79-03906) (EIS-Katz)
W79-03936

THE BEHAVIORAL ASPECTS OF AQUATIC TOXICOLOGY,
B. A. Flerov
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 122-132, 1978. 2 fig., 2 tab., 48 ref.

Descriptors: *Fish behavior, *Bioassay, Toxicity, Mortality, Fresh water fish, Phenols, Insecticides, Pesticides, Pulp and paper industry, Lotos-71, PolychlorpinEne, Chlorophos, Avoidance reaction, Intoxication, Conditioned reflex activity, Aquiculture, Sublethal effects, Aquatic toxicology

The behavioral responses of aquatic organisms to changes in water quality are review. Some of these respones are disturbances of the equilibrium reflex, violent behavior, increase in general excitability, abundant excretion of mucilage, and avoidance reactions and adaptation. (See also W79-03906) (EIS-Katz)c
W79-03937

GEOLOGIC POLLUTION PROBLEMS OF LAKE SUPERIOR,
For primary bibliographic entry see Field 5B
W79-03938

EXPERIMENTAL APPLICATION OF VARIOUS SYSTEMS OF BIOLOGICAL INDICATION OF WATER POLLUTION,
For primary bibliographic entry see Field 5A
W79-03939

STRUCTURAL AND FUNCTIONAL CHARACTERISTICS OF SESTON AS INDICES OF WATER POLLUTION,
For primary bibliographic entry see Field 5A
W79-03940

ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING, PART I: FISHES OF PICEANCE CREEK, COLORADO, PRIOR TO OIL SHALE PROCESSING,
Colorado Div. of Wildlife, Fort Collins. Fisheries Research Center.
J. P. Goettl, and J. W. Edde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 87[illegible] Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-096, October 1978. 2[illegible] p, 1 fig, 1 tab, 29 ref. R803950.

Descriptors: *Fishes, *Fish populations, *Piceance Creek(Colorado), *Oil shales, Water pollution, Environmental effects, Fish migration, Fish reproduction, Surveys, Freshwater fish, Brook trout, Bullheads, Brown trout, Sampling

A survey was made of the fish populations of Piceance Creek, Colorado, to establish existing conditions prior to anticipated extensive oil shale processing in the area. Thirteen species of fish have been reported to occur in Piceance Creek; eight of them were recovered in this sampling. The mountain sucker and the speckled dace were the most numerous and widespread. Salmonids were most abundant at the three upper sampling stations of the creek, and brook trout were found in both tributaries. Population estimates of the mountain sucker were 61 and 36 fishes/100 m of stream at stations PC-2 and PC-3 during 1976. Survey results indicate that brook trout and brown trout are reproducing naturally in the creek, but rainbow trout are doing poorly. Species introduced from other drainages and the effects of creek alteration and agricultural diversions have produced changes in the fish fauna of this creek. Data reported in earlier research have been compared to data collected in this survey. Potential impacts of oil shale processing on the fish population of Piceance Creek are discussed. (See also W79-03975) (Dawson-IPA)
W79-03974

ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING, PART II: THE AQUATIC MACROINVERTEBRATES OF THE

PICEANCE BASIN, COLORADO, PRIOR TO OIL SHALE PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
L. J. Gray, and J. V. Ward.

Descriptors: *Benthos, *Aquatic biota, *Streams, *Piceance Basin(Colorado), Environmental effects, Oil shales, Streamflow, Sampling, Biomass, Biota, Water pollution, Tributaries, Downstream, Upstream, Sediments, Aquatic life.

A study of the benthic macroinvertebrate communities on four streams in the Piceance Basin of north-western Colorado prior to oil shale mining and processing is reported. Environmental conditions varied longitudinally along the Piceance Creek, the major stream studied. The downstream direction showed greatly increased amount of total dissolved solids, sodium, sulfate and chloride. It also exhibited increases in temperature range, turbidity, severity of winter ice conditions, and effects of grazing and irrigation activities. Winter species of fauna inhabit the upstream areas of the creek, and its tributaries, while summer species inhabit the downstream regions. Of the 83 total macroinvertebrates collected only two were common at all sites indicating that these species are tolerant of a widely varying physical and chemical conditions which exist. The fauna of Black Sulphur Creek was generally similar to the middle Piceance sites, and Willow Creek fauna closely resembled Black Sulphur Creek fauna. A discussion of the impact of mining on this creek and its tributaries is general in nature, because the effects will depend on the types of extraction and processing to be used and the steps taken to protect the stream environment. (See also W79-03974) (Davison-IPA)
W79-03975

EVALUATING THE SAMPLING FREQUENCIES OF WATER QUALITY MONITORING NETWORKS,
Colorado State Univ., Fort Collins. Dept. of Agriculture and Chemical Engineering.
R. C. Ward, and K. S. Nielsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 367, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. EPA-600/7-78-169, August 1978. 30 p, 1 fig, 4 tab, 10 ref, 1 append. CB-6-99-2530-A.

Descriptors: *Water sampling, *Water quality control, *Data collections, *Networks, *Sampling frequencies, Water analysis, Water quality, Monitoring, Design criteria, Water quality standards, Human population, Data storage and retrieval, STORET, Colorado, Minnesota.

A simple easy to use procedure for evaluating sampling frequencies in a routine fixed-station, water-quality monitoring network used for regulatory water-quality management purposes is presented. Evaluation of a regulatory water-quality monitoring system involves examining: sampling station locations, parameter coverage, and sampling frequencies. The procedure uses data currently in the Environmental Protection Agency's STORET inventory routine to compute the sample statistics, based on the assumption that each parameter follows the normal distribution: these sample statistics are then assumed to represent the 'population' parameters. The population parameters are used to examine the uniformity and size of the precisions about water quality mean. The evaluation procedure is demonstrated with data from the Colorado and Minnesota state water-quality management programs. It is recommended that future work in network design and data analysis be closely coordinated with the STORET system. (Davison-IPA)
W79-03976

DISTRIBUTION OF PHYTOPLANKTON IN ILLINOIS LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
M. K. Morris, L. R. Williams, W. D. Taylor, F. A. Hiatt, and S. C. Hern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 411, Price codes: A07 in paper copy, A01 in microfiche. EPA-600/3-78-050, May 1978. 128 p, 3 tab, 11 ref, 1 append.

Descriptors: *Illinois, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Data collections, *National eutrophication survey, *Baseline studies, Bioindicators, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists.

Phytoplankton species composition and abundance were determined for 31 Illinois lakes and reservoirs; in addition, the trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed: Bloomington, Carlyle, Charleston, Decatur, Lou Yaeger, Marie, Shelbyville, Springfield, Story, Sanfchris, Holiday, We-Ma-Tuk, and Vandalia; Coffeen, Crab Orchard, Long, Pistakee, Rend, Highland, Vermilion, Wonder, Depue, Fox, Grass, East Loon, Slocum, Cedar, Raccoon, Baldwin, and Horsehoe Lakes; and Old Ben Mine Reservoirs. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. (Lynch-Wisconsin)
W79-03989

DISTRIBUTION OF PHYTOPLANKTON IN NORTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
M. K. Morris, L. R. Williams, W. D. Taylor, F. A. Hiatt, and S. C. Hern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 387, Price codes: A05 in paper copy, A01 in microfiche. EPA-600/3-78-051, May 1978. 73 p, 3 tab, 11 ref.

Descriptors: *North Carolina, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Data collections, *National eutrophication survey, *Baseline studies, Bioindicators, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists.

Phytoplankton species composition and abundance were determined for 16 North Carolina lakes and reservoirs; in addition, the trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Badin, Blewett Falls, Fontana, Hickory (Lake Oxford), High Rock, Hiwassee, James, Junaluska, Lookout Shoals, Mount Island, Norman, Rhodhiss, Santeelah, Tillery, Waterville and Waccamaw. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W79-03990

DISTRIBUTION OF PHYTOPLANKTON IN INDIANA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
F. A. Morris, M. K. Morris, L. R. Williams, W. D. Taylor, and F. A. Hiatt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 352, Price codes: A05 in paper copy, A01 in microfiche. EPA-600/3-78-078, August 1978. 70 p, 3 tab, 11 ref, 1 append.

Descriptors: *Indiana, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Data collections, *National eutrophication survey, *Baseline studies, Bioindicators, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists.

Phytoplankton species composition and abundance were determined for 27 Indiana lakes and reservoirs; in addition, the trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed: Cataract, James, Wawasee, Webster, Whitewater, Winona, Westler, Witmer, Tippecanoe, Dallas, Olin, Oliver, Sylvan, Hovey, Versailles, Bass, Crooked, Long, Pigeon, Marsh, Hamilton, Maxinkuckee and James; and Geist, Mississinewa, Monroe, and Morse Reservoirs. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W79-03991

INORGANIC SPECIES IN WATER: ECOLOGICAL SIGNIFICANCE AND ANALYTICAL NEEDS, A LITERATURE REVIEW,
Environmental Research Lab., Athens, GA.
T. B. Hoover.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 945, Price codes: A06 in paper copy, A01 in microfiche. EPA-600/3-78-064, July 1978. 99 p, 2 fig, 518 ref.

Descriptors: *Reviews, *Bibliographies, *Inorganic compounds, *Pollutants, *Toxicity, *Water pollution effects, Chemicals, Heavy metals, Arsenic, Chromium, Lead, Mercury, Selenium, Absorption, Aquatic plants, Aquatic animals, Public health, Algae, Fish, Sublethal effects, Path of pollutants, Bioaccumulation, Analytical techniques, Water bodies, Speciation, Rivers, Lakes, Oceans, Estuaries, Impounds.

A literature review of environmental significance of inorganic chemical species (as opposed to total element content) in water emphasizes effects on human health and on plant and animal life. The bibliography lists 518 works, giving special attention to recent U.S. Government reports and conference proceedings. The role of valence state, ionization, complexation, and absorption in the transport and cycling of elements are considered, together with factors affecting distribution of elements and species in freshwater streams and impoundments, and in estuaries and the sea. Information on chronic effects on human health of trace inorganic pollutants is almost entirely limited to total elements because of lack of an adequate methodology to distinguish among forms of an element. Of greatest concern with respect to toxicity of

different species are arsenic, chromium, lead, mercury, and selenium. In the toxicology of aquatic biota, there is a growing appreciation that both acute and chronic effects are strongly related to chemical species. Movement of inorganic species in the aquatic environment is strongly influenced by absorption on both mineral and organic particulates. Absorption is highly dependent on the chemical species of the pollutant. (Lynch-Wisconsin)
W79-03992

POLYCHLORINATED BIPHENYLS IN PRECIPITATION IN THE LAKE MICHIGAN BASIN,
DePaul Univ., Chicago, IL.
T. J. Murphy, and C. P. Rzeszutko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 363, Price codes: A03 in paper copy, A01 in microfiche. EPA-600/3-78-071, July 1978. 32 p, 4 fig, 5 tab, 46 ref, 1 append. 803 915.

Descriptors: *Lake Michigan, *Polychlorinated biphenyls, *Precipitation, *Rainfall, *Fallout, *Air pollution effects, *Water pollution sources, Lake Michigan Basin, Great Lakes, Lakes, Chicago(IL), Illinois, Beaver Island(MI), Michigan, Poisons, Pollutants, Landfills, Snow, Arochlor, Dry fallout, Particulates, Gases, Industrial wastes.

Analysis of rainfall samples from Chicago, Illinois (1975-77) and Beaver Island, Michigan (1976) for polychlorinated bphenyls (PCBs) showed precipitation as the major known source of PCBs to Lake Michigan. Since concentrations in samples from the two sites were about equal, it is concluded that PCBs are widely distributed by the atmosphere. Significant concentrations were also found in two other areas some distance from urban and industrial centers, indicating that sources of PCBs to the atmosphere are diffuse and residence times are long; PCB concentrations in snow samples from Mammoth Cave, Kentucky were similar to those of Chicago. Volume weight mean concentration from 35 rain samples from Chicago and Beaver Island was 111 ng/l of PCBs as Arochlor 1242 + 1254 + 1260, indicating a deposition rate of 4800 kg PCB/yr to Lake Michigan from precipitation. Comparison of air and precipitation samples showed most PCB present in the atmosphere as vapor, with the rest as particulate. This finding, together with the high solubility of PCBs in nonpolar organics, casts doubt on the validity of monitoring dry deposition of PCBs using collectors covered with nonpolar liquids such as mineral oil. Gas samples from a vented sanitary landfill had PCB concentrations in the microgram/cu m range, indicating landfills may be an important source of PCBs to the atmosphere. (Lynch-Wisconsin)
W79-03993

THE SELENASTRUM CAPRICORNUTUM PRINTZ ALGAL ASSAY BOTTLE TEST EXPERIMENTAL DESIGN, APPLICATION, AND DATA INTERPRETATION PROTOCOL,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5A.
W79-03996

SIZE DEPENDENT MODEL OF HAZARDOUS SUBSTANCES IN AQUATIC FOOD CHAIN,
Manhattan Coll., Bronx, NY.
R. V. Thomann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 009, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Duluth, Minn. Report EPA-600/3-78-036, April 1978. 40 p, 7 tab, 11 fig, 216 ref.

Descriptors: Methodology, *Polychlorinated biphenyl, *Lake Ontario, Great Lakes, Water pollution effects, Mathematical models, Lakes, *Coho salmon, Freshwater fish, Smelts, Sculpins, Water analysis, On-site-investigations, Alewife, *Food chains, Food habits, Organism size, Mathematical studies, Chlorinated hydrocarbon pesticides.

A model of toxic substance accumulation is constructed that introduces organism size as an additional independent variable. The model represents an ecological continuum through size dependency; classical compartment analyses are therefore a special case of the continuous model. Size dependence is viewed as a very approximate ordering of trophic position. The analysis of some PCB data in Lake Ontario is used as an illustration of the theory. A completely mixed water volume is used. Organism size is considered from 100 m to 10 to the sixth power m. PCB data were available for 64 m net hauls, alewife, smelt, sculpin and coho salmon. The analysis indicated that about 30% of the observed 6.5 g PCB/gm fish at the coho salmon size range is due to transfer from lower levels in the food chain and about 70% from direct water intake. The model shows rapid accumulation of PCB with organism size due principally to decreased excretion rates and decreased biomass at higher trophic levels. The analysis indicates that if a level of 5 g PCB/gm at 10 to the sixth power m is sought, total (dissolved and particulate) water concentration would have to be about 36 ng/l or about 66% of the present 55 ng/l. (EIS-Katz)
W79-03997

FATE OF 3,3'-DICHLOROBENZIDINE IN AQUATIC ENVIRONMENTS,
Syracuse Research Corp., NY. Life Sciences Div.
For primary bibliographic entry see Field 5B.
W79-03998

FATE AND IMPACT OF PENTACHLOROPHENOL IN A FRESHWATER ECOSYSTEM,
University of Southern Mississippi, Hattiesburg. Inst. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-03999

HUMAN POPULATION EXPOSURES TO MIREX AND KEPONE,
Stanford Research Inst., Menlo Park, CA. Center for Resource and Environmental Systems Studies.
B. E. Suta.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 430, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/1-78-045, June 1978. 139 p, 8 tab, 118 ref.

Descriptors: *Public health, *Insecticides, Pesticides, Water pollution, Path of pollutants, Poisons, Human diseases, *Food chain, Sport fish, Sport fishing, Water quality, Water sources, Water supply, Domestic water, *Mirex, *Kepone, *Human exposure, *Commercial fish.

Human exposures to mirex and kepone are assessed in this study. Three major paths of exposure are examined: ingestion through the food chain, inhalation of atmospheric mirex and kepone, and exposure through drinking water. Exposure through the food chain appears to be the most pressing current problem. Various species of commercially caught fish in certain areas of the country have been found to contain slight amounts of the compounds. It is difficult to obtain estimates of the human exposure from sport fish, but evidence seems to suggest that sportsmen and their families may be exposed through fish. Also, game captured in the southeastern U.S. has been found to contain the compounds. Kepone has been found in mothers' milk in some areas of the country. Atmospheric exposures are not considered terribly great now, since the compounds are no longer produced and the major atmospheric exposures are believed to be occupational exposure at the producing factory and exposure to workers' families from clothing, etc. Human exposure to mirex and kepone from drinking water supplies does not appear to be a problem, since both compounds are very insoluble in water. Exposure through tobacco was also considered. (EIS-Katz)
W79-04000

5D. Waste Treatment Processes

SIMULATION OF ADVANCED WASTEWATER TREATMENT SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
P. T. Lam, G. J. Farquhar, and E. A. BcBean.
Water Pollution Research Canada, Vol 13, 1977/1978, p 97-120. 13 fig, 4 tab, 35 equ, 42 ref.

Descriptors: *Simulation analysis, *Waste water treatment, *Performance, *Computer models, *Projects, Lime, Ammonia, Filtration, Carbon, Adsorption, Chlorination, Fluctuations, Equations, Operations research, Regression relationship, Prediction, Recarbonation.

Simulation models for advanced wastewater treatment system component processes were identified or developed as necessary. They were used to simulate the performance of existing systems including lime treatment, ammonia stripping, recarbonation, filtration and carbon adsorption. Comparisons between predicted and measured effluent properties were reasonable. The component models were combined into an integrated model and used to simulate the operation of the Santee Project advanced wastewater treatment system. Simulations were again reasonable. It was concluded that the combined model could be used to provide realistic estimates of system efficiency response to variations in input parameters. (Bell-Cornell)
W79-03524

LEAST-COST DESIGN OF URBAN-DRAINAGE NETWORKS,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. Froise, and S. J. Burges.
Journal of the Water Resources Planning and Management Division, Vol 104, No WR1, Proceedings of the American Society of Civil Engineers, p 79-92, November 1978. 8 fig, 1 tab, 12 equ, 22 ref.

Descriptors: *Urban drainage, *Design, *Storm sewers, *Storage, *Dynamic programming, *Cost minimization, Planning, Optimization, Hydraulics, Hydrology, Flow routing, Networks, Simulation analysis, Water flow, Hydrographs, Steady state, Mathematical models, Equations, Systems analysis.

This paper demonstrates the feasibility of applying dynamic programming (DP) to the least-cost design of drainage networks which include storage elements. Network layouts are assumed to be known from previous planning activities, hydrographs at network inlets have been taken as given and the approach is demonstrated for a hypothetical case. For the purpose of this work, urban drainage networks are defined as combinations of conveyance and storage elements. The optimization problem is cast as an N-stage sequential process; in DP terminology, network nodes or junctions are treated as the stage variable, conduit invert elevations at the junctions as the state variable, and maximum flow rates and conduit sizes as decision variables. Using DP and unsteady flow routing, the problem is solved by a stagewise double pass over the network. All feasible solutions and the state transformations are determined followed by a second pass over the same stages for purposes of routing the inflow hydrographs of the stage variable. In conclusion, the method converges to global optima, requires small amounts of data, and is associated with reasonable computation requirements. (Bell-Cornell)
W79-03533

PLANNED WASTEWATER REUSE, A LITTLE USED RESOURCE.
Municipal Environmental Research Lab., Cincinnati, OH
For primary bibliographic entry see Field 3C
W79-03569

POLLUTION ABATEMENT IN A COPPER WIRE MILL.

Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 455, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA/625/2-73/003, August 1973. 13 p, 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Water pollution control, *Copper, Copper alloys, Industrial wastes, Chemical wastes, Effluents, Water quality control, Industrial water, Electrolysis, Comparative costs, Liquid wastes, Solid wastes, Water conservation.

A process for reducing water consumption in copper wire mills by 90% is described. The process consists of three basic steps: (1) regeneration and copper recovery system for the primary pickling; (2) chemical rinse; and (3) a secondary pickling using hydrogen peroxide and proprietary additives. High purity metallic copper was recovered from the regenerated sulfuric acid pickle through continuous electrolysis. Plant water consumption was reduced from 200,000 gallons per day to 20,000 gallons per day, and total solids leaving the plant were reduced from 2500 lbs per day to less than 100 lbs per day. Estimated annual savings of this pollution abatement program compared to a waste treatment only program were $163,000 or $2.61 per finished ton of wire, based on 6,000 hours of operation per year of a 62,500 ton capacity plant. Five installations manufacturing copper and copper alloy products are currently using this process. This chemical rinse technique is also applicable to electroplating operations. (Davison-IPA)
W79-03572

COLOR REMOVAL FROM KRAFT PULPING EFFLUENT BY LIME ADDITION.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 135, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA/625/2-73-002, April 1973. 13 p, 7 fig, 2 tab.

Descriptors: *Water pollution control, *Color, *Industrial wastes, *Waste water treatment, *Pulp wastes, Pulp and paper industry, Sedimentation, Lime, Neutralization, Separation techniques, Waste storage, Water purification, Pilot plants, Sludge.

The operation of a full scale process for lime decolorization of kraft pulping total mill effluent is discussed. Slaked lime was applied to the total mill effluent, and during primary sedimentation mixed fibrous and lime decolorization sludges were removed. The effluent was then stored in a basin where biochemical stabilization took place. Excessive lime alkalinity was neutralized in the basin by absorption of atmospheric carbon dioxide. A pilot-scale study of recarbonation for enhanced lime separation and more rapid effluent neutralization prior to biochemical stabilization to obtain preliminary design data is discussed. Potential savings of raw material by recovery of the lime used is estimated at $78,000 annually. (Davison-IPA)
W79-03573

A FEASIBILITY STUDY OF RESPONSE TECHNIQUES FOR DISCHARGES OF HAZARDOUS CHEMICALS THAT DISPERSE THROUGH THE WATER COLUMN,
Little (Arthur D.), Inc., Cambridge, MA.
E. Drake, D. Shooter, W. Lyman, and L. Davidson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 968, Price codes: A12 in paper copy, A01 in microfiche. Final Report No. CG-D-16-77, July 1976. 254 p, 27 fig, 51 tab, 39 ref, 4 append. DOT-CG-51122-A.

Descriptors: *Water pollution treatment, *Spills, *Chemicals, *Hazards, Chemical wastes, Neutralization, Solvent extractions, Precipitation, Chelation, Water chemistry, Water properties, Water treatment, Waste treatment.

The feasibility of treating hazardous chemical spills which are soluble in water was investigated. Four different methods were examined in detail as response techniques for ameliorating these spills: neutralization, solvent extraction, precipitation, and chelation. For each technique, the principles are described, requirements for alleviating the ecological impact of the spill are presented, the rationale for the screening of potential agents is discussed, and the most appropriate agents are selected. The potential application methods of the preferred agents are described, and the environmental considerations of both the effects of the spilled chemical and the application of the agent are discussed. It is concluded that: neutralization seems feasible and practical for treating spilled chemicals which are acids and bases; sodium bicarbonate is recommended for acids, sodium dihydrogen phosphate for bases; solvent extraction is feasible but has practical limitations; vegetable oil is the most satisfactory solvent agent; chemicals ameliorated by precipitation contain cations and anions, so that a single agent is not effective for both types; chelation is limited in applicability to the same chemicals considered for precipitation. (Davison-IPA)
W79-03578

PHARMACEUTICAL INDUSTRY: HAZARDOUS WASTE GENERATION, TREATMENT, AND DISPOSAL.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 800, Price codes: A09 in paper copy, A01 in microfiche. Report No EPA/SW-508, 1976. 190 p, 19 fig, 62 tab, 69 ref, 2 append.

Descriptors: *Waste treatment, *Pharmaceutical industry, *Waste disposal, *Industrial wastes, Hazards, Fermentation, Incineration, Landfills, Organic wastes, Effluents, Biochemical oxygen demand, Costs, Cost analysis, Basic data collections, Surveys, Solid wastes, Water pollution control, Surveys.

Studies were made to provide the Environmental Protection Agency (EPA) with: (1) a data base concerning the current and projected types and amounts of industrial waste and applicable disposal methods and costs; (2) a data base for technical assistance activities; and (3) and a background for development work as required by the Solid Waste Disposal Act as amended. The basic objectives of this study were: (1) to determine the characterization of pharmaceutical industry wastes (1973), and to project these wastes to 1977 and 1983; (2) to define the current treatment and disposal practices within the industry; (3) to investigate improved control technologies potentially applicable in reducing the hazards of these wastes; and (4) to calculate costs for the implementation of three levels of control technology in a hypothetical or existing plant. Information concerning research and development, biological products, fermentation, organic synthetics, extraction of animal glands, and formulation and packaging operations was extrapolated from surveys conducted during site visits. Eight landfills and four contractors treating wastes by incineration were visited. It is expected that quantities of hazardous and nonhazardous wastes will increase proportionately with production with no significant effect of air and water guidelines for 1977 and 1983. About 5,600 metric tons of hazardous wastes and 150,000 metric tons ot total wastes are finally disposed of on land in secure chemical landfills or are encapsulated. Generalized costs of treatment are summarized, and costs for 'end-of-pipe' treatment and disposal of each hazardous waste are calculated. (Davison-IPA)
W79-03579

ISSUES IN WASTE WATER TREATMENT FACILITY LOCATION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Urban Planning and Policy Development.
For primary bibliographic entry see Field 5G.
W79-03594

FLUORIDE REMOVAL AND RELEASE BY ALUMINUM SULFATE FLOC,
Auburn Univ., AL. Dept. of Civil Engineering.
J. B. Thomas, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 562, Price codes: A10 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 89 p, 13 fig, 16 tab, 54 ref, append. OWRT A-043-ALA(2).

Descriptors: *Fluorides, *Alum coagulation, Sludge storage, *Water treatment, *Waste water treatment, Hydrogen ion concentration, *Coagulation, *Turbidity, Alkalinity, Fluoride content.

An experimental investigation was conducted to determine the amount of previously added fluoride removed during alum coagulation. The effects of time, turbidity, pH and amount of fluoride addition were examined and various methods for determining different forms of fluoride were investigated. Furthermore, the release of fluoride during sludge storage was studied. Turbid water samples of known turbidity, alkalinity and fluoride content were coagulated with alum by the standard jar test procedure, and analyzed for residual fluoride and aluminum content. Greatest fluoride removal occurred at pH 6.5 and carryover aluminum concentrations were found to corrspond directed to optimum alum doses. A method for measuring complexed and uncomplexed forms of fluoride was attempted. Sludge samples were placed in plastic bottles and stored in the laboratory. Supernatant from these bottles was collected at monthly intervals and over a five month period the fluoride content of the supernatant was found to change. Bottom samples were collected at various points along Wilmore Creek which receives sludge discharges from the Auburn Water Treatment Plant. The samples were found to decrease in fluoride content with increasing distance from the point of sludge discharge.
W79-03677

INSECT PEST PROBLEMS ASSOCIATED WITH WASTEWATER OXIDATION LAKES IN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Entomology.
For primary bibliographic entry see Field 5G.
W79-03684

BIOLOGICAL AND ECOLOGICAL STUDIES ON THE INTERACTION OF BDELLOVIBRIO AND ENTEROBACTERIACEAE,
Auburn Univ., AL.
For primary bibliographic entry see Field 5C.
W79-03691

NOTE ON THE FERTILITY VALUE OF OXIDATION POND EFFLUENT FOR GROUNDNUT (ARACHIS HYPOGAEA L.),
Central Public Health Engineering Research Inst., Nagpur (India).
C. K. Kale.
Indian Journal of Agricultural Science, Vol. 43, No. 5, p 523-525, May, 1973. 2 tab, 4 ref.

Descriptors: *Legumes, *Phosphorus, Effluents, *Oxidation lagoons, Nutrients, *Sewage treatment, *Fertilizers, *Waste water treatment, Waste treatment, Water reuse, *Groundnut(Arachis hypogaea L), *India.

The value of domestic sewage as a fertilizer was tested at an oxidation pond, using groundnut as the test plant. Seven tratments were used, including a tap-water control. N,P, and K concentrations of the fertilizers are given. The effect of different treatments on root growth was significant at 5 percent level. Synthetic sewage and control gave similar results. The effect of irrigation treatments on the vegetative growth of the groundnut was significant at the 1 percent level. Although the addition of phosphorus to this effluent gave a

better yield, the increase over the effluent alone was not significant. It is believed that the shortage of phosphorus in comparison to nitrogen and pottassium in the raw sewage and effluent was compensated for by other nutrient elements, including microelements. (Carpenter-FIRL)
W79-03696

WATER SYSTEM VIRUS DETECTION,
National Aeronautics and Space Administration Washington, DC. (Assignee).
For primary bibliographic entry see Field 5A.
W79-03784

SYSTEM FOR POLLUTION SUPPRESSION,
TII Corp., Lindenhurst, NY. (Assignee).
E. T. Armstrong.
U.S. Patent No. 4,119,273, 12 p, 14 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 975, No 2, p 589, October 10, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Equipment, Anaerobic conditions, Trickling filters, Distribution.

A rotary arm distributor apparatus distributes an equal amount of liquid for each unit area of an apparatus such as a tricking filter. The rotary distributor arm comprising improved distribution nozzles and flow control accomplished by a gradual taper of the arm itself is defined which ensures a uniform flow distribution across the full radius of the distributing medium so that uniformity and optimum economy and efficiency are achieved with respect to the trickling filter itself because a uniform fluid flow is distributed across the entire top surface. (Sinha - OEIS)
W79-03788

METHOD OF DISPOSING OF A FERROUS-ION CONTAINING ACIDIC AQUEOUS WASTE FOR FORMING POLYCRYSTALLINE IRON COMPOUND PARTICLES,
Nippon Electric Co. Ltd., Tokyo. (Assignee)
K. Iwase, T. Takada, and M. Kiyama.
U.S. Patent No. 4,119,536, 3 p, 10 ref, Official Gazette of the United States Patent Office, Vol 975, No 2, p 671, October 10, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Separation techniques, Iron compounds, Chemical precipitation, Acidic water.

Acidic waste including ferrous or bivalent iron ions, for example, the waste lye of a pickle for articles made of iron and a waste that inevitably results during production of titanium white includes, besides the ferrous ions, either halogen or sulfate ions and is strongly acidic. On disposing of the acidic waste the ferrous ions are oxidized to produce iron compound precipitate in a remaining waste liquid. With the temperature of the waste kept between 50 degrees C and 75 degrees C and with pH of the waste liquid adjusted between 3.5 and 5.2, fine particles of the iron compound otherwise produced agglomerate into large polycrystalline particles. The large particles are readily separated from the waste liquid, which is now substantially neutral and transparent. (Sinha-OEIS)
W79-03790

TREATMENT OF WASTE LIQUID AND APPARATUS THEREFOR AND A FERTILIZER COMPOSITION OBTAINED THEREBY,
Nittetu Chemical Engineering Ltd., Tokyo (Japan). (Assignee)
T. Yamauchi, M. Akune, and S. Kouchi.
U.S. Patent No. 4,119,538, 6 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 975, No 2, p 671, October 10, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Organic wastes, Inorganic compounds, Incineration, Fertilizers, Concentration, Fermentation industry.

A process for treating a waste liquid which is obtained from a fermentation process, e.g., an alcohol fermentation, and contains organic and inorganic substances which are useful as fertilizer, is provided. The process includes combusting a concentrate of the waste liquid and bringing the combustion products containing the ashes which are formed from the inorganic substances and the hot combustion gases into direct contact with a fresh portion of the waste liquid. The liquid is concentrated by evaporation and a slurry of the ashes in the concentrated waste liquid is formed. The slurry is separated into a solid sediment containing the minerals and a part of the organic components of the liquid. By drying the sediment with agitation, a granulate which can be used as a fertilizer can be produced. (Sinha-OEIS)
W79-03792

COMBINED FILTER AND INCINERATOR,
Thiokol Corp., Newtown, PA. (Assignee).
D. P. Clark, and W. F. Wagner.
U.S. Patent No. 4,120,792, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 975, No 3, p 1102, October 17, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, *Filtration, *Incineration, *Filters, Solid wastes, Ships.

An enclosure having an inlet and an outlet for hot air, and an inlet and an outlet for waste water, contains a number of refractory, porous, tubular, membrane-type filters, each of which is closed at one end and connected at its other end to the waste water outlet. Hence, waste water entering through its inlet in the enclosure must pass through the walls of the filter tubes before being discharged through its outlet. During this process, any solid particles in the water become deposited on the outer surfaces of the filter tubes. After a filtering cycle is over and the waste water has been drained through its outlet, a heating means, equipped with a blower and attached to the hot-air inlet, forces heated air into the enclosure to incinerate the solids deposited on the filter tubes. Therefore, the filter tubes serve also as refractory grates to hold the sludge while it burns. After the sludge has been burned, an automatic timer switches back to the filtering cycle. (Sinha-OEIS)
W79-03797

ECONOMIC ANALYSIS, ROOT CONTROL, AND BACKWATER FLOW CONTROL AS RELATED TO INFILTRATION/INFLOW CONTROL,
American Public Works Association, Chicago, IL.
For primary bibliographic entry see Field 5G.
W79-03841

THE EFFECT OF SEWAGE (MECHANICALLY, BIOLOGICALLY, AND CHEMICALLY TREATED) ON ALGAL GROWTH,
Vandkvalitetsinstitute, Hoersholm (Denmark).
For primary bibliographic entry see Field 5C.
W79-03854

MONITORING THE EFFECTS OF CHEMICAL AND BIOLOGICAL WASTE WATER TREATMENT IN SITU BY DIALYSIS CULTURES OF FRESHWATER ALGAE,
Bergen Univ. (Norway). Inst. for General Microbiology.
For primary bibliographic entry see Field 5A.
W79-03883

MODELING OF N- AND P- UPTAKE BY SCENEDESMUS ACUTUS, WITH REGARD TO TERTIARY TREATMENT OF DOMESTIC WASTE WATER,
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
For primary bibliographic entry see Field 5C.
W79-03885

RESEARCH ON THE TERTIARY TREATMENT OF SWINE MANURE BY MASS CULTURING OF ALGAE,
Ghent Rijksuniversiteit (Belgium). Lab. for Biological Research in Environmental Pollution.
N. De Pauw, E. Bruggeman, and G. Persoone.
In: Symposium: Experimental use of Algal Culture in Limnology, 26-28 October 1976, Sandefjord, Norway. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mittelungen No. 21, June 1978, p 490-506. 4 fig, 3 tab, 27 ref.

Descriptors: *Manure, *Hogs, *Tertiary treatment, *Algae, *Waste treatment, *Farm wastes, *Nutrient removal, Livestock, Cultures, Semicontinuous cultures, Batch cultures, Phytoplankton, Chlorophyta, Scenedesmus acutus var. alternanan Chlorella vulgaris, Coelastrum proboscideum, Nutrients, Nitrogen, Phosphorus, Carbon dioxide, Hydrogen ion concentration, Beneficial use, Bioassay, Belgium, Raceways, Biochemical oxygen demand

Laboratory and outdoor (raceway) experiments in Belgium demonstrated the feasibility of tertiary treatment of swine manure by mass culturing of three species of chlorophyte algae. Laboratory assays with the algae (Scenedesmus acutus var. alternans, Chlorella vulgaris, and Coelastrum proboscideum) showed that both diluted and undiluted aerated swine manure constitute excellent substrates for the algae, yielding several grams dry algae per liter of waste. Addition of carbon dioxide to the cultures for pH stabilization resulted in much better algal growth. In the outdoor raceways (with paddles) satisfactory algal growth was achieved with diluted waste, except during winter when temperatures are too low and day length too short. During spring and summer yields of over 10 g/sq m/day were obtained. Nitrogen and phospghorus were generally reduced more than 90%. Addition of carbon dioxide had little or no effect on nutrient elimination. With control of nutrient input based on calculation of the theoretical yield under prevailing light conditions, good results can be obtained, and the algal biomass may be harvestible as a cheap food protein source. Stock cultures were maintained at high concentrations on solid (agar) and liquid media, and batch cultures for inoculation to the raceways were preadapted to swine manure by addition of 5% swine effluent to the artificial medium. Manure was subjected to secondary treatment before the experiments. (See also W79-03842) (Lynch-Wisconsin)
W79-03886

REUSE OF TREATED FRUIT PROCESSING WASTEWATER IN A CANNERY,
Snokist Growers, Yakima, WA
For primary bibliographic entry see Field 3E.
W79-03966

ASSESSMENT OF POTENTIAL TOXIC RELEASES FROM LEATHER INDUSTRY DYEING OPERATIONS,
SRI International, Menlo Park, CA
For primary bibliographic entry see Field 5B
W79-03972

STATE-OF-THE-ART REPORT: PESTICIDE DISPOSAL RESEARCH,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5E.
W79-03986

BIODEGRADATION STUDIES OF CARBOXYMETHYL TARTRONATE,
Municipal Environmental Research Lab., Cincinnati, OH. Wastewater Research Div.
E. F. Barth, H. H. Tabak, and C. I. Mashni
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 970 Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, EPA-600/2-78-115 July 1978. 34 p, 6 tab, 7 fig, 25 ref

Descriptors: *Activated sludge, *Biodegradation, Laboratory tests, *Waste treatment, Waste water disposal, Waste water pollution, Laboratory tests

Microorganism, Municipal wastes, Analytical methods, Methodology, Gas chromotography, Biomass, *Carboxymethyl tartronate.

Carboxymethyl tartronate (CMT) was shown to be biodegradable in bench-scale activated sludge reactors. After initial exposure to CMT in continuous flow systems an acclimation period of 14 weeks was necessary before efficient degradation occurred. Once acclimated to CMT the biomass could be starved in regard to this substrate for at least 1.6 times the sludge age and still retain capacity to degrade the material upon re-introduction. Activated carbon was not found to be effective for CMT removal at a pH value of 7. (EIS-Katz)
W79-03994

5E. Ultimate Disposal Of Wastes

UTILIZING SOLID WASTES FOR BUILDING MATERIALS,
Municipal Environmental Research Lab., Cincinnati, OH.
R. E. Landreth.
News of Environmental Research in Cincinnati, January 25, 1977. 4 p, 2 fig, 2 ref.

Descriptors: *Ultimate disposal, *Waste treatment, *Recycling, *Construction materials, Wastes, Phenols, Fly ash, Industrial wastes, Plastics, Wood wastes, Solid wastes.

Research on the application of solid waste materials which could be integrated into standard composite products for the building industry is reported. Successful utilization of waste materials for this purpose includes: (1) an assessment of the type, location and volume; (2) development of the material into a composite product, (3) development of the product into standard building components; (4) economic evaluation; and (5) a utility demonstration as full scale units. Laboratory studies indicated that furfurals, inorganics, and phenols were the best materials to be used as binding agents or matricies. Materials useful as reinforcement were also useful as filler materials; wood bark, waste plastic rice hulls, peanut shells and fly ash were selected for composite development. Various combinations of waste materials and methods produced a product comparable to commercially available particle board, a potential replacement for sheet rock, fire doors, and fire rated partition walls. The inorganic composites would not burn, and produced no smoke, which eliminates some fire hazards. It is concluded that building products developed from waste materials are structurally sound, aesthetically pleasing and can be produced at 50 to 70% of the costs of standard building materials. (Davison-IPA)
W79-03570

BIOGAS RECOVERY FROM SOLID WASTES,
Municipal Environmental Research Lab., Cincinnati, OH.
C. A. Clemons.
News of Environmental Research in Cincinnati, September 15, 1976. 4 p, 1 fig, 10 ref.

Descriptors: *Waste disposal, *Biogasification, *Ultimate disposal, *Anaerobic digestion, Sludge digestion, Methane, Animal wastes, Landfills, Farm wastes, Municipal wastes, Sewage sludge, Sludge treatment, Economic feasibility, Solid wastes.

A summary of research and current activities relating to biogasification of solid wastes is presented. Anaerobic digestion of cattle wastes has been studied as to feed quality of the sludge and economic feasibility by the Northern Regional Research Center of the Department of Agriculture in Illinois. Further study involving the building of a digester in Nebraska is expected to establish the nutritional value of these residues. A number of universities are involved in research on animal wastes from cattle, swine, horses and poultry, and have built digesters to process these wastes. Research is being sponsored by the Energy Research and Development Administration on biogasification at Stanford, Cornell, the University of California at Berkeley, and the University of Illinois. Companies financing the construction of large-scale digesters to produce pipe-line quality methane include: ERA Incorporated of Lubbock, Texas, and Calorific Recovery Anaerobic Process Incorporated of Oklahoma City. Operational parameters of the process as applied to urban trash have been defined and a computer analysis of the economics of the process has been prepared. Biogas produced from sewage sludge is of poor quality and low quantity because the toxic materials present in human sewage sludge destroy or inhibit anaerobic digestion. Land fills are a comparatively small source of biogas. Methane has been recovered from the Los Angeles County, Palos Verdes landfill by Reserve Synthetic Fuels which has plans to develop other methane recovery sites in California, Arizona, Illinois, New Jersey, New York, and Pennsylvania. (Davison-IPA)
W79-03571

PHARMACEUTICAL INDUSTRY: HAZARDOUS WASTE GENERATION, TREATMENT, AND DISPOSAL.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5D.
W79-03579

SURVEY OF BENTHIC CORAL REEF ECOSYSTEMS, FISH POPULATIONS, AND MICROMOLLUSKS IN THE VICINITY OF THE WAI'ANAE SEWAGE OCEAN OUTFALL, O'AHU, HAWAII -- SUMMER 1975,
Hawaii Univ., Honolulu. Water Resources Center.
S. A. Reed, E. Kay, and R. Russo.
Technical Report No. 104, May 1977. 34 p, 10 fig, 4 tab, 14 ref, 2 append.

Descriptors: *Benthic ecosystems, Fish populations, *Coral reefs, *Hawaii, Outfalls, Waste disposal, Sewage disposal, *Mollusks, *Diversity indices, *Similarity indices, *Sewage ocean outfall, Marine survey.

A marine survey was conducted in the vicinity of the present and proposed Wai'anae sewage ocean outfall site on the southwest coast of O'ahu, Hawaii. The survey at depths of 6 to 30 m (20-100 ft) characterized quantitatively the coral reef community, the reef fish population, and micro-molluscan assemblages. Diversity indices were calculated for substrate, fish, and micromollusks. Similarity indices were computed and a dendrograph was generated for all stations. The stations could be clustered into three distinct regions: (1) a deep-water region (18-30 m depth) with smooth hard algae-covered limestone substrate and sand, low fish abundance and diversity, low micromollusk diversity with high abundance of dialids, and low abundance of archeogastropods and rissoids; (2) a shallow-water region (6-18 m depth) with comparatively high coral cover, high fish abundance and diversity, high micromollusk diversity with low abundance of dialids and high abundance of rissoids and archeogastropods; and (3) the region along the harbor channel at POHA'I Bay where coral cover, fish abundance and diversity, and micromolluscan species abundance were distinctly different from those of other stations, indicating a probable influence by the boat harbor and channel on the benthic community. The sewage effluent has not adversely influenced coral growth in the vicinity of the outfall diffuser, although increased nutrients may account for high abundance of frondose algae at this station.
W79-03591

THE EFFECT OF WASTEWATER TREATMENT ON METHANOGENESIS IN A MARINE OUTFALL,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5C.
W79-03636

THE EFFECTS OF SPARY IRRIGATION ON A MIXED FOREST ECOSYSTEM,
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-03679

EFFECT OF SOIL MOISTURE CONTENT UPON ADSORPTION AND MOVEMENT OF PHOSPHORUS FROM LEACHATES OF DOMESTIC WASTE DISPOSAL SYSTEMS,
Maine Univ. at Orono.
For primary bibliographic entry see Field 5B.
W79-03683

MEASUREMENT OF THE ENGINEERING PROPERTIES OF MUNICIPAL INCINERATOR RESIDUES AND CONSIDERATION OF LEACHATE CHARACTERISTICS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W79-03685

EFFECTS OF SPARY IRRIGATION OF MUNICIPAL WASTEWATER ON THE PHYSICAL PROPERTIES OF THE SOIL,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5C.
W79-03766

METHOD OF DISPOSING OF A FERROUS-ION CONTAINING ACIDIC AQUEOUS WASTE FOR FORMING POLYCRYSTALLINE IRON COMPOUND PARTICLES,
Nippon Electric Co. Ltd., Tokyo. (Assignee)
For primary bibliographic entry see Field 5D.
W79-03790

ARRANGEMENT FOR DISPOSING OF FLUID FLOATING MATTER,
Mitsui-Osaka Maritime Construction Co. Ltd. (Japan). (Assignee).
For primary bibliographic entry see Field 5G.
W79-03793

COMBINED FILTER AND INCINERATOR,
Thiokol Corp., Newtown, PA. (Assignee).
For primary bibliographic entry see Field 5D.
W79-03797

THE BEHAVIOR OF NUTRIENT ELEMENTS ADDED TO A FOREST SOIL WITH SEWAGE SLUDGE,
Washington Univ., Seattle. Center of Ecosystem Studies.
For primary bibliographic entry see Field 5B.
W79-03805

IMPACT OF NEARSHORE DEVELOPMENT ON OPEN COASTAL RESOURCES,
Southern California Coastal Water Research Project, El Segundo, CA.
For primary bibliographic entry see Field 5C.
W79-03829

THE ALGAL GROWTH POTENTIAL OF AN INLAND SALINE AND EUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03891

CHANGES IN SUCCESSION RATE IN A NATURAL PHYTOPLANKTON COMMUNITY FOLLOWING NUTRIENT ENRICHMENT,
Stockholm Univ. (Sweden). Inst. of Botany.
For primary bibliographic entry see Field 5C.
W79-03894

PCBS: THEIR ENVIRONMENTAL SIGNIFICANCE AND DISTRIBUTION IN RHODE ISLAND,
Rhode Island Univ., Narragansett. Coastal Resources Center.
For primary bibliographic entry see Field 5B.
W79-03964

POLLUTION CONTROL GUIDELINES FOR COAL REFUSE PILES AND SLURRY PONDS.
Wahler (W. A.) and Associates, Palo Alto, CA.
For primary bibliographic entry see Field 5G.
W79-03968

PRELIMINARY ENVIRONMENTAL ASSESSMENT OF BIOMASS CONVERSION TO SYNTHETIC FUELS,
Battelle Columbus Labds., OH.
For primary bibliographic entry see Field 5G.
W79-03973

INVESTIGATION OF LANDFILL LEACHATE POLLUTANT ATTENUATION BY SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W79-03983

A CASE STUDY OF HAZARDOUS WASTES IN CLASS I LANDFILLS,
Southern California Univ., Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5B.
W79-03984

LINERS FOR SANITARY LANDFILLS AND CHEMICAL AND HAZARDOUS WASTE DISPOSAL SITES,
Ebon Research Systems, Silver Spring, MD.
For primary bibliographic entry see Field 5G.
W79-03985

STATE-OF-THE-ART REPORT: PESTICIDE DISPOSAL RESEARCH,
Midwest Research Inst., Kansas City, MO.
R. R. Wilkinson, G. L. Kelso, and F. C. Hopkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 716, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-183, September 1978. 246 p, 32 fig, 29 tab, 182 ref, 3 append. 68-03-2527.

Descriptors: *Reviews, *Pesticide removal, *Waste treatment, *Waste disposal, Incineration, Pesticide treatment, Degredation, Chemical wastes, Landfills, Anaerobic digestion, Ultimate disposal, Chemical reactions, Cost analysis, Environmental effects, Reviews.

A review of published and unpublished information on recent and continuing research and development on waste or excess pesticide disposal and conversion methods is presented. The methods were categorized according to four approaches: high temperature incineration; physical/chemical treatment; biological methods; and land disposal. Potential economic costs and environmental impacts, problems of field disposal of finished pesticide formulations, and present and potential future 'problem' pesticides are also examined. It was concluded that for all methods examined, that more study would be required because potential environmental and economic impacts had not been adequately or completely defined. Of the 55 problematic pesticides, considered as potential or future waste problems, 23 have been researched for potential disposal methods which can be made environmentally acceptable. (Davison-IPA)
W79-03986

BIODEGRADATION STUDIES OF CARBOXYMETHYL TARTRONATE,
Municipal Environmental Research Lab., Cincinnati, OH. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W79-03994

5F. Water Treatment and Quality Alteration

IMPROVED WATER SOFTENING PROCESS,
J. D. Sheppard, and D. G. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PAT APPL-533 048, Price codes: A02 in paper copy, A01 in microfiche. Patent Application, Serial No. 533, 048, February 25, 1975. 9 p, 1 fig, 1 tab.

Descriptors: *Water treatment, *Water softening, Demineralization, Filtration, Membrane processes, Quality control, Separation techniques, Hardness(Water), Calcium compounds, Magnesium compounds, Lime-soda process.

An innovative process of softening water hardness caused by CaCO3 and Mg(OH)2 is discussed. A modified form of the lime-soda process is employed coupled with cross-flow filtration. A principal feed source of this process is derived from the lime-soda process whereby large-scale hardness is removed through the addition of slaked lime in large tanks; the precipitated hardness allowed to settle. The resulting slurry serves as feed for the cross-flow filtration. This involves pumping feed through a porous pipe on which is deposited a thin permeable layer of finer porosity than the pipe. The feed water passes across the deposited layer and across the tube wall, and is collected as a filtered product. Feed hardness as high as 5000 ppm has been processed by this method. (Davison-IPA)
W79-03574

SIMPLE, EFFECTIVE METHOD FOR PURIFYING THE AS-1 CYANOPHAGE,
California Univ., Riverside, Dept. of Plant Pathology
M. B. Barkley, and P. R. Desjardins.
Applied and Environmental Microbiology, Vol. 33, No. 4, p 971-974, April 1977. 3 fig, 5 ref. OWRT B-176-CAL(2).

Descriptors: *Viruses, *Water purification, *Microbiology, Laboratory tests, Dialysis, Centrifugation, Bentonite, Aeration, Evaporation, Microorganisms, Water pollution sources, Toxicity, Infection.

A new method for purifying the AS-1 cyanophage virus involves treating virus-induced culture lysates with unfractionated bentonite, dialysis against 0.01M tris (hydroxymethyl) aminomethane-hydrochloride buffer, rotary evaporation concentration, and centrifuging through linear sucrose gradient columns. Small amounts (100 ml) of lysate are required to obtain relatively high yields of highly infectious virus. Bentonite clarification along with density gradient centrifugation could be used for the purification of other cyanophages. (Davison-IPA)
W79-03583

FLUORIDE REMOVAL AND RELEASE BY ALUMINUM SULFATE FLOC,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-03677

ECONOMIC ANALYSIS OF CHLOROFORM REMOVAL FROM DRINKING WATER,
Maryland Univ., College Park. Bureau of Business and Economic Research.
J. H. Cumberland, and K. Choi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 574, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, Technical Report No. 49, 1978. 52 p, 7 fig, 11 tab, 46 ref, append. OWRT A-032-MD(1), 14-34-0001-8022.

Descriptors: Water treatment, Potable water, *Chloroform, Water quality, Damage function, *Treatment costs, Cost-benefit analysis, *Economic analysis, Cost analysis, *Alternative costs.

Recent research has demonstrated that organic contaminants of potential health significance are ubiquitous in America's drinking water. Among these many compounds, chloroform is rapidly becoming an object of state and federal regulatory interest because several scientific studies have found a link between cancer death rates and concentration levels of chlorogorm in drinking water. The purpose of this study is to provide an assessment of the scientific and technical information needed to conduct a benefit-cost analysis of removing chloroform from drinking water. The analysis focuses on the derivation of a benefit function from the removal of chloroform in finished drinking water, and then compares the derived benefits with costs associated with control methods. This study also provides a systematic framework for coordinating diverse data and a method of analyzing the way that different assumptions would affect the alternatives liklely to be considered by the regulatory agency.
W79-03680

EVALUATION OF A PROTOTYPE AUTOMATED POND WATER TREATMENT UNIT,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
C. E. Rice, J. E. Garton, and M. L. Magnuson
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 750, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Inst. Oklahoma State Univ. Research Project Tech Completion Rept 1978. 17 p, 2 fig, 4 tab, 2 ref. OWRT-A-066-OKLA(1).

Descriptors: *Water treatment, *Ponds, *Filtration, *Filters, *Turbidity, Alum treatment, Performance, Maintenance, Operations, Rural water supply, Upflow filter.

Two automatic pond water filtration units were tested with performance evaluated by analysis of both raw and treated water samples. A large filter, three feet in diameter, was tested and provided water at just over two gpm per square foot. The small filter, with an area of one square foot, was tested at various flow rates, run lengths, and total operating times. Both units were upflow filters with flocculation taking place below the filter media. The units effectively reduced turbidity as indicated by analysis of raw and purified water. High turbidity waters could not be effectively treated, and high flow rates gave unsatisfactory results. The filters had to be operated at or close to the design flow of one gpm per square foot. Correct alum dosage were important to insure a functional filter system. Maintenance of the system required periodic refilling of chemical solution tanks, backwashing of the filter, and replacement of filter media. These operations could easily be done in conjunction with a time clock regulation of the system.
W79-03764

COLLOID FREE PRECIPITATION OF HEAVY METAL SULFIDES,
For primary bibliographic entry see Field 5G.
W79-03778

WATER SUPPLY SYSTEM,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (Germany, F. R.). (Assignee)
P. Paschakarnis, B. Hengst, and R. Wychnanek
U.S. Patent No. 4,119,520, 9 p, 4 fig, 3 ref. Official Gazette of the United States Patent Office, Vol. 975, no 2, p 666, October 10, 1978.

Descriptors: *Patents, *Water purification, Water quality control, *Electrolysis, Filtration, *Oxidation, Electrodes, *Anodic oxidation

A water system capable of purifying raw water by anodic oxidation is described. The system include

an electrolytic cell adapted to hold a body of water to be purified. Two electrodes are mounted in the cell and electrically insulated from each other. The cell is fastened to a pump, to a power supply, and to a control device. The pump supplies the water to the cell and discharges purified water from the cell in a predetermined path. The power supply supplies electrolyzing current to the electrodes in the cell. The control device generates a sensible signal, such as an optical signal, which indicates the operating condition of the pump and of the power supply. Additionally a filter removing particulate impurities from the water discharged by the cell may include a filter element arranged in the water path upstream from the cell. (Sinha-OEIS)
W79-03789

METHOD FOR SLIME CONTROL,
For primary bibliographic entry see Field 5G.
W79-03791

MANUAL FOR THE INTERIM CERTIFICATION OF LABORATORIES INVOLVED IN ANALYZING PUBLIC DRINKING WATER SUPPLIES -- CRITERIA AND PROCEDURES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5A.
W79-03979

THE MULTIELEMENTAL ANALYSIS OF DRINKING WATER USING PROTON-INDUCED X-RAY EMISSION (PIXE),
Purdue Research Foundation, Lafayette, IN.
For primary bibliographic entry see Field 5A.
W79-03981

HUMAN POPULATION EXPOSURES TO MIREX AND KEPONE,
Stanford Research Inst., Menlo Park, CA. Center for Resource and Environmental Systems Studies.
For primary bibliographic entry see Field 5C.
W79-04000

5G. Water Quality Control

THE PRESENT SITUATION AND THE RATE OF SELF-PURIFICATION OF THE UPPER REACHES OF THE SUKHONA RIVER,
Akademiya Nauk SSSR, Leningrad. Inst. of Ozerovedeniya.
D. N. Aleksandrova, and T. D. Slepukhina.
Hydrobiological Journal, Vol. 13, (2), 1977, p 76-81. 3 tab, 2 fig, 8 ref. (translated from Russian).

Descriptors: *Water pollution effects, *Biodegradation, *Biological communities, Biology, Sediments, Self-purification, Benthos, Oligochaetes, Water quality, Hydrology, *Sukhona River, Phytoplankton, Zooplankton, Bacteria, Biomass, Biological diversity, USSR.

Studies on a 42 km long zone of the Sukhona river were made, testing for 26 hydrological, hydrochemical, and biological factors. Changes in biological processes and factors along the river were discovered. The pollution rates of self-purification of the water and bottom soils, based on the relative numbers of Oligochaeta, the index of species diversity of the macrobenthos and the ratio between the total numbers of bacteria and the numbers of saprophytes growing on beef-extract agar (and also on the BOD5) are estimated. (EIS-Deal)
W79-03505

UREA FERTILIZATION OF NATURAL FOREST: EFFECTS ON WATER QUALITY,
Laurentian Forest Research Centre, Quebec (Ontario).
For primary bibliographic entry see Field 5C.
W79-03507

ALLOCATIONAL INEFFICIENCY OF BENEFIT/COST APPLIED TO WATER AND SEWERAGE SUPPLY: INTERACTIONS BETWEEN TIME-SERIES AND CROSS-SECTIONAL MODELS,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-03520

URBAN RUNOFF CONTROL MASTER PLANNING,
American Society of Civil Engineers, Marblehead, MA. Urban Water Resources Research Program.
For primary bibliographic entry see Field 6B.
W79-03532

CALIFORNIA CHANGES ITS ENVIRONMENTAL QUALITY ACT,
California Resources Agency, Sacramento.
N. E. Hill.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 104, No WR 1, p 265-271, November 1978. 1 appen.

Descriptors: *Environmental engineering, *Legislation, *Government agencies, *California, *Urban planning, Natural resources, Conservation, Urban development.

Studies showed that California EIR's had become too large and costly. The documents did not help part-time city councilmen respond to problems. In some cases, the documents were prepared and then ignored. Despite these problems, the studies found that review of environmental impacts was valuable and should be improved. Following these studies, the California Legislature amended the law in 1976 to shorten EIR's, to focus the reports on environmental problems, and to require agencies to respond to those problems. A summary, a list of references, and a table of contents or index were required to help readers find critical information. Through a requirement for findings, public agencies are now required to solve environmental problems or to explain why the problems could not be solved. These changes provide more integration of environmental, economic and social concerns in the environmental analysis process. (Bell-Cornell)
W79-03535

DELAWARE RIVER BASIN WATER RESOURCES MANAGEMENT,
Delaware River Basin Commission, Trenton, NJ.
For primary bibliographic entry see Field 6B.
W79-03538

WET/DRY COOLING SYSTEMS FOR FOSSIL-FUELED POWER PLANTS: WATER CONSERVATION AND PLUME ABATEMENT,
United Engineers and Constructors, Inc., Philadelphia, PA.
M. C. Hu, and G. A. Englesson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 625, Price codes: A13 in paper copy, A01 in microfiche. Report EPA-600/7-77-137, November 1977, 275 p, 38 fig, 38 tab, 14 ref, 16 append. 68-03-2202.

Descriptors: Environmental effects, *Cooling towers, *Powerplants, Cost analysis, Design, Design criteria, Fog, *Water conservation, Pollution.

This report presents the results of a design cost study for wet/dry cooling tower systems used in conjunction with 1000 MWe coal-fired power plants to reject waste heat dry tower systems can be designed to provide significant economic advantages over dry cooling while closely matching the dry tower's ability to conserve water. This economic advantage can be maintained by wet/dry systems which save as much as 98% of the make-up water required by wet towers. The advantage of wet cooling over wet/dry cooling may be small in areas with remote water supply sources. In areas where water costs are excessive, wet/dry cooling can reach economic parity with wet cooling. Ground fogging from low profile wet cooling towers can be reduced by design changes which increase the number of cells without significantly increasing the total evaluated cost of the wet cooling tower. In cases of restrictive site conditions or fogging limitations, wet/dry cooling towers may be used effectively at costs approximating those of enlarged wet towers. (Chilton-ORNL)
W79-03547

DESIGN AND ANALYSIS OF AQUATIC MONITORING PROGRAMS AT NUCLEAR POWER PLANTS,
Battelle Pacific Northwest Labs., Richland, WA.
D. H. McKenzie, L. D. Kannberg, K. L. Gore, E. M. Arnold, and D. G. Watson.
Available from the National Technical Information Service, Springfield, VA 22161 as PNL-2423, Price codes: A07 in paper copy, A01 in microfiche. PNL-2423, NRC-1; November 1977. 129 p, 42 fig, 17 tab, 36 ref, 1 append. DOE EY-76-C-06-1830.

Descriptors: Environmental effects, *Powerplants, *Monitoring, Aquatic life, Design, Sites, Control, *Aquatic environments.

This report addresses some of the problems of designing, conducting, and analyzing aquatic environmental monitoring programs for impact assessment. The concept of control and treatment station pairs, based on the hypothesis that the relationship between the two stations forming the pair can be estimated from the preoperational period and that this relationship holds during the operational period, is the fundamental basis for the experimental method proposed. The major problem in establishing station pairs is identified as being the location of the control station which must remain unaffected by the operation of the power plant. The control station must also be near enough to the power plant that the biological communities will respond to natural environmental changes consistently in the same manner. The collection of balanced data sets is also identified as an important concept in the design of aquatic monitoring programs. The report proposes guidelines for some of the problems encountered during the statistical analysis of data. (Chilton-ORNL)
W79-03566

CHEMICAL ADDITIVES FOR IMPROVEMENT OF OIL SPILL CONTROL,
Rensselaer Polytechnic Inst., Troy, NY.
W. H. Bauer, D. N. Borton, J. J. Bulloff, and S. Ross.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A009 019, Price codes: A09 in paper copy, A01 in microfiche. Final Report No. CG-D-83-75, August 1974. 133 p, 9 fig, 7 tab, 717 ref, 1 append. DOT-CG-33755-A.

Descriptors: *Oil spills, *Waste water treatments, *Chemcontrol, *Bibliographies, Water pollution sources, Oil pollution, Laboratory tests, Data collections, Entrainment, Polyethylene, Viscosity, Waste treatment, Coagulation, Waste treatment, Coagulation, Waste water treatment, Water pollution control, Water pollution abatement, Water pollution treatment.

Abstract literature and Coast Guard information were used to develop a base of information for this state of the art report. From this data, apparatus and methods were developed to study the effects of chemical additives for improving oil spill control. Sixteen types of oil and two highly purified hydrocarbon reference oils were tested with various chemical additives. The additives exhibiting the most effectiveness in improving oil control performance were then studied over a range of concentrations in the chosen test oil and at a selected concentration in other oils. Oil soluble polyethylenes and ethylene-propylene copolymers were found to be the most effective. The oil exhibited a wide range of viscosities and interfacial tensions, but they all showed initial droplet formation and entrainment at oil-water cocurrent velocities of about 0.5 knots. An extensive bibliography is provided. (Davison-IPA)

W79-03575

DEMONSTRATION OF INTERIM TECHNIQUES OF POLLUTED BEACHWATER,
Cleveland Dept. of Public Works, OH.
J. F. Weber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 192, Price codes: A09 in paper copy, A01 in microfiche Report No. EPA-600/2-76-228, September 1976. 181 p, 64 fig, 48 tab, 4 ref, 9 append. 11020 EZW.

Descriptors: *Beaches, *Water pollution, *Lake Erie, *Water pollution abatement, Waste water treatment, Barriers, Disinfection, Chlorination, Water quality control, Public health, Organic wastes, Sewage, Municipal wastes, Outfall sewers, Swimming.

The contaminated beaches on Lake Erie bordering Cleveland were made safe for swimming through interim techniques designed to keep the beaches safe until long range goals could be implemented The beach areas became contaminated from combined sewer overflows, and floating debris. Physical barriers were designed to separate the lake water from the beach water, to keep out the sewer debris and to retard the diffusion of the disinfectant into the deep water. Floating debris was removed with nets and larger debris such as logs were removed with a bulldozer and a dump truck. Sodium hypochlorite diluted with fresh water provided a positive displacement of the water within the barriers and reduced the infiltration of the contaminated lake water into the enclosure. Streams and storm overflows with outfalls near the swimming areas were chlorinated to reduce bacterial levels. The three methods of reducing lakefront contamination were: (1) the addition of flow increasing polyelectrolytes into an interceptor sewer to reduce combined sewer overflow; (2) flushing lateral sewers of residential areas during dry weather, reducing the 'first slug' effect of settled solids during a storm; and (3) cleaning debris from rivers and streams before it reached the lake. Bacterial aftergrowth was studied to develop a method to optimize chlorination as a disinfectant. (Davison-IPA)
W79-03576

ISSUES IN WASTE WATER TREATMENT FACILITY LOCATION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Urban Planning and Policy Development.
M. R. Greenberg.
Growth and Change, Vol. 3, No. 1, p. 38-43, January, 1972. 1 tab. (OWRT-C-1629(No. 3147)(7).

Descriptors: Water resources, *Urban land use, *Sewerage, *Waste water treatment, Planning, Water supply, Environmental effects, Water quality, Locating, Regions, *Treatment facilities, Facility location, Regionalization.

The principle usually followed in waste water treatment plant location is to establish regional control with a minimum number of plants, frequently one at the lowest point in each drainage system. State and county government generally support this concept. The Federal Water Quality Act recommends development of comprehensive river basin studies, encouragement of interstate compacts, and requirement of conformability with basin studies for federal grants, with a 10% incremental grant if the plant is part of a metropolitan regional plan. The federal program goal is a drastic reduction of pollution loads of waste water dischrges by 1975. Effectiveness of regionalization can be evaluated from the perspectives of planning, economics, and environment. The regional plant has the potential of halting the sparse settlement of undeveloped areas by higher income populations because its greater capacity will permit development at densities greater than the small local plant. Development can be expected to follow the location of large trunk lines. Impact of regional plants on cities is debatable. Industries required to upgrade waste water treatment may prefer to close or relocate, with resultant loss of employment for monitory groups, rather than pay higher user charges for the regional system. Significant economies of scale design, construction, and operation favor the regional treatment plant. Environmentally, a regional system would enhance public water supplies and recreational activities Streams would not receive effluents in vast stretches. Groundwater supplies would not be polluted by malfunctioning septic tank systems. However, costly monitor and storage systems must be provided in treatment plants to prevent disastrous discharge of toxic wastes. (Edwards - North Carolina)
W79-03594

ANALYSIS OF DIFFERENT TYPES OF DRY-WET COOLING TOWERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8C.
W79-03661

OPTIMUM COMBINATIONS OF COOLING ALTERNATIVES FOR STEAM-ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8C.
W79-03662

PUBLIC PARTICIPATION IN 208 WATER QUALITY PLANNING: A CASE STUDY OF TRIANGLE J COUNCIL OF GOVERNMENT, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning; and North Carolina Univ at Chapel Hill. Center for Urban and Regional Studies
S. Herzberg.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 587, Price codes: A04 in paper copy, A01 in microfiche. Report, April 1978, 66p, 9 ref, 3 append. OWRT A-096-NC(1), 14-34-0001-8035.

Descriptors: *Public participation, *Advisory groups, *Citizen participants, Decision-making, *State governments, *Local governments, *North Carolina.

The evaluation of methods of public participation in water quality planning is being undertaken by the Public Participation Study Group of the Department of City and Regional Planning, UNC-CH. A completed 208 planning process was studied to identify issues and problems of public participation in water quality planning in North Carolina context. The overall research includes description and analysis of the various participation activities undertaken during preparation of the statewide plan, from state level advisory groups to local involvement in small area plans. The primary aim is to compare the effectiveness of different methods of public participation during the stages of the planning process. (Kiger-North Carolina).
W79-03666

ADSORPTION AND DESORPTION IN MINE DRAINAGES,
Colorado School of Mines, Golden
For primary bibliographic entry see Field 5B.
W79-03673

WATER RESOURCE STANDARDS FOR SECOND HOME AND RECREATIONAL LAND DEVELOPMENT,
North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies
L. F. West.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 681, Price codes: A03 in paper copy, A01 in microfiche Research Memorandum April 1977. 42 p, 1 fig, 22 ref. OWRT A-092-NC(1), 14-34-0001-8035

Descriptors: *Recreation, *Land development, *Vacation sites, Water supply, Sewage disposal, *North Carolina.

In recent years the North Carolina mountains have faced a rapid influx of second home and recreational land development. Unfortunately, increased land development in this region is resulting in the gradual degradation of once pristine waters. At the same time there is increased demand for high quality water for human consumption. While some water resources problems would have resulted from any kind of development, many of them can be traced to particular development and construction practices which have been recognized by experts as particularly destructive to the environment. Numerous standards for land development focusing on minimizing the adverse effects on the area's water resources have been identified. The purpose of these criteria and standards is to facilitate the development of an evaluation form which can be used to analyze specific second home projects regarding their impact on the area's water resources. Standards and criteria were selected largely on the basis of their susceptibility to field measurement. As such, very few engineering or detailed design criteria were included. The dominant emphasis was on site criteria, such as lot size standards and the appropriate spacing of different facilities, which directly relate to water quality. These land development standards have been divided into six major functional categories: (1) water supply; (2) sewage disposal; (3) slopes, stormwater runoff and sedimentation; (4) floodplains; (5) open space and recreation; and (6) golf course development. While the inter-relationship between these six areas is quite significant, it is still possible to identify specific standards and criteria relating to each functional area. (Kiger-North Carolina)
W79-03675

ECONOMIC ANALYSIS OF CHLOROFORM REMOVAL FROM DRINKING WATER,
Maryland Univ., College Park. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 5F
W79-03680

INSECT PEST PROBLEMS ASSOCIATED WITH WASTEWATER OXIDATION LAKES IN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Entomology
R. W. Merritt
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 610. Price codes: A03 in paper copy, A01 in microfiche. Institute of Water Research, Michigan State University Project Completion Report, December, 1978. 46 p, 8 fig, 4 tab, 32 ref. OWRT A-085-MICH(1), 14-31-0001-5022.

Descriptors: *Waste water pollution, *Midges, *Oxidation lakes, *Insects, Sewage, Diptera, *Oxidation lagoons, *Environmental factors, *Distribution, Abundance, *Michigan, Larvae.

The distribution and abundance of larval Chironomidae were investigated in the first and last lakes of a 4-lake sewage oxidation system. Chironomid species composition and adult seasonal occurrence were examined and the potential of certain species to become pests of man was evaluated. A stratified random sampling program was employed to quantitatively sample larvae in Lakes 1 and 4. Each lake was stratified by depth, distance from the influent site, and wind. Samples were taken during the summer and early fall of 1976 and during late spring and early summer 1977. Chironomidae was the dominant subfamily in both lakes initially the Orthocladiinae gradually becoming dominant in Lake 4 by early summer 1977. The patterns of larval distribution and abundance in Lakes 1 and 4 indicate that the Chironomidae actively responded to differences in oxygen and nutrient availability in the sediments by migrating to areas offering favorable conditions. Oxygen appeared to be the limiting factor in Lake 1, nitrogen and phosphorus in Lake 4
W79-03684

METHODOLOGIES OF EXAMINING POLLUTION FROM URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W79-03689

CONTRIBUTED PAPERS ON COASTAL ECOLOGICAL CHARACTERIZATION STUDIES. FOURTH BIENNIAL INTERNATIONAL ESTUARINE RESEARCH FEDERATION CONFERENCE, OCTOBER, 1977.
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
For primary bibliographic entry see Field 2L.
W79-03697

ENVIRONMENTALIZING AGRICULTURAL PRODUCTION CONTROL POLICIES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
W. D. Seitz, and R. G. F. Spitze.
Journal of Soil and Water Conservation, Vol. 28, No. 2. p. 61-64, 1 fig, 10 ref. March-April 1973. OWRT A-061-ILL(3), 14-31-0001-3813.

Descriptors: Agriculture, *Environmental control, *Economics, *Land management, Soil conservation, Agriculture policy, Policy alternatives, Watershed linear programming.

Ongoing public agricultural policies, which are the results of years of compromise among parties with competing interests reveal little sensitivity to their effects on environmental quality. Public price, income and production control policies in agriculture relate to problems of soil erosion and sedimentation. Current critical review of the 1970 Agricultural Act suggests that land retirement programs for the future are likely to be changed. Various public policy proposals are examined which alter the current set-aside program as a means of increasing agriculture's performance from environmental quality perspective. Possible program changes include (1) alteration in requirements for program participation to include soil conservation practices, (2) intrastate payment variation reduction, (3) interstate payment variation reduction, and (4) use of incentives for improved management practices on all farms. The first three proposals involve modification of the price, income, production control program. These proposals would shift production to areas that are less prone to erosion and extend the use of soil conservation practices on participating farms. The final proposal would tend to improve management practices of all farm operations so as to reduce the level of sedimentation.
W79-03767

ENVIRONMENTAL QUALITY, THE MARKET, AND PUBLIC FINANCE,
Clemson Univ., S. C. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W79-03768

FEDERAL COMPLIANCE WITH STATE POLLUTION CONTROL REQUIREMENTS - CALIFORNIA V. ENVIRONMENTAL PROTECTION AGENCY, 511 F. 2D 963 (9TH CIR. 1975),
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-03770

COLLOID FREE PRECIPITATION OF HEAVY METAL SULFIDES,
R. M. Schlauch.
U.S. Patent No 4,102,784, 7 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1614, July 25, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Water purification, Heavy metals, Chemical precipitation, Separation techniques, Sulfides, Ions.

In a method of precipitating heavy metal pollutant ions from an aqueous solution by adding a metal sulfide having a higher equilibrium sulfide ion concentration than the sulfide of the heavy metal pollutant, the metal sulfide is added in the form of a slurry. The slurry is prepared in a specific manner to cause large particle size of the precipitate. The object of the invention is to provide a process of removing heavy metal pollutants as a substantially large size precipitate without the formation of a colloid. The colloid formation of heavy metal sulfides can be avoided or minimized by slow addition of the solution of ferrous ions to a solution of sulfide ions at a controlled rate in the absence of heavy metal pollutant ions, and adding the resulting slurry of large particle size precipitate of ferrous sulfide to the stream containing the metal pollutants to be removed. (Sinha-OEIS)
W79-03778

SYSTEM AND METHOD FOR COOLING HOT WATER FROM INDUSTRIAL PLANT COOLING USE,
R. H. Rasmussen.
U.S. Patent No 4,117,683, 9 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 975, No 1, p 49, October 3, 1978.

Descriptors: *Patents, *Industrial water, *Thermal pollution, *Water pollution treatment, *Water quality control, Water cooling, Cooling water, Harbors, Temperature, Port improvement.

A system for thermal disposal and port improvement comprises an industrial plant constituting a source of hot cooling water which must be cooled. It is located along a navigable river, lake or ocean--the body of water constituting a port. Hot cooling water is delivered from the industrial plant to the port water to cool the water throughout the year and to prevent it from freezing shut in winter. Cool cooling water from the port water is delivered to the industrial plant. The method of cooling hot cooling water from the industrial plant comprises removing the hot cooling water as an effluent stream and directing the stream to the top portion of a holding and cooling lake open to the atmosphere to effect reduction of the temperature by evaporation and conduction, and withdrawing cool cooling water from the bottom portion of the lake and sending it back to the industrial plant for cooling purposes. (Sinha-OEIS)
W79-03779

APPARATUS AND METHOD FOR SAMPLING WATER FOR FISH LARVAE AND OTHER TROPHIC LEVELS,
Lawler, Matusky and Skelly Engineers, Tappan, NY. (Assignee)
For primary bibliographic entry see Field 7B.
W79-03781

METHOD FOR SLIME CONTROL,
H. Finkelstein.
U.S. Patent No. 4,119,537, 4 p, 2 tab, 5 ref, Official Gazette of the United States Patent Office, Vol 975, No 2, p 671, October 10, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Industrial water, Water pollution treatment, Water quality control, Slime, Microorganisms, Inhibitors, Pulp and paper industry.

These chemical formulations and agents are to be used as water treatment agents in industrial water systems to control and improve such factors as bacteriological contamination, pollution and cleanliness. Chemical limes, hydrosulfites and dispersants are used together in a formulation, in relatively low concentrations, to primarily inhibit and destroy slime and microorganisms. No toxicants as such are needed. In addition, the chemical lime particles can be coated to give a delayed and safer reaction with water and to give reduced dusting. (Sinha-OEIS)
W79-03791

ARRANGEMENT FOR DISPOSING OF FLUID FLOATING MATTER,
Mitsui-Osaka Maritime Construction Co. Ltd. (Japan). (Assignee).
S. Makaya.
U.S. Patent No. 4,119,541, 15 p, 22 fig, 1 tab, 19 ref; Official Gazette of the United States Patent Office, Vol. 975, No. 2, p. 672, October 10, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Oily water, Red tide, Floating, Separation techniques, Flow separation, Oil recovery.

Floating matter such as red tide or discharged oil floating on water surface, e.g., floating on the ocean surface, can be removed completely. The invention is designed for a small amount of fluid floating matter spreading over a vast area such as rainbow-colored membrane. Also it is possible not only to recover the fluid floating matter but also makes it possible to remove and recover a larger amount of fluid floating matter through a continuous process. A recovery-separation tank is used with an inner water surface lower than that of the outside. The floating matter, such as oil floating on the surface of water outside the recovery-separation tank is drawn in through an inlet. The floating matter and water are separated into layers which flow into the recovery-separation tank and a drain pump discharges the water lying in the lower portion of the tank. (Sinha-OEIS)
W79-03793

OIL SLICK REMOVAL AND RECOVERY SYSTEM,
R. D. Ellis.
U.S. Patent No 4,120,788, 9 p, 8 fig, 2 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 974, No 3, p 1101, October 17, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, Water quality control, Absorption, Foaming, *Oil slicks, Containment, Oil recovery, Foam sandwich.

This system provides a method by which oil slicks are contained, removed and recovered from a water surface by providing a layer of surbent material, such as foam, under the oil slick and above the oil slick to sandwich the oil. A foam spreading apparatus is provided which includes a floating boom attached to a towing vessel, the boom having spreader units placed above and below the oil slick to discharge the foam forming a sandwich for the oil slick. The apparatus includes a harvesting vessel for cutting and shredding the foam sandwich and a recovery for separating the oil from the strips. (Sinha-OEIS)
W79-03796

INVESTIGATION OF THE FEASIBILITY OF DEWATERING BURIED VALLEY SANDS TO AID SEWER-TUNNEL EXCAVATIONS, EDMONTON, ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8D.
W79-03824

PROCEEDINGS OF THE 1977 OIL SPILL RESPONSE WORKSHOP.
National Coastal Ecosystems Team, NSTL Station, MS.
Publication No. FWS/OBS/77-24, September 1977. 158 p. Fore, P.L. (Ed.).

Descriptors: *Oil spills, *Oil pollution, *Planning, Water pollution effects, Environmental effects, Wildlife habitats, United States, *Outer Continental Shelf, Polluton Contingency Plan.

An Oil Spill Response Workshop was held in Metairie (New Orleans), Louisiana, from 15 to 17 February 1977 to improve the Service's capability and effectiveness in responding to oil spills. The workshop was cosponsored by the Office of Migratory Bird Management and the Office of Biological Services, Fish and Wildlife Service, U.S.

Department of the Interior. THe objectives of the workshop were: to discuss overall Service responsibilities, capabilities, and procedures in responding to spills; to disseminate current information concerning biological impacts of oil on wildlife, techniques for minimizing impacts, and other information essential for developing an effective response by the Service to oil spills; to present views of other agencies and organizations on their role in responding to oil spills and their relationship to the U.S. Fish and Wildlife Service; and to Critique the recently drafted oil spill contingency plan of the Service and assist in preparing a final plan. (See W79-03831 thru W79-03840)
W79-03830

STATUS AND FUTURE TRENDS IN OIL SPILLS AND IMPLICATIONS FOR THE U.S. FISH AND WILDLIFE SERVICE,
Fish and Wildlife Service, Washington, DC. Office of Migratory Bird Management.
A. E. Fletcher.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No. FWS/OBS/77/24, September 1977. p 11-22, 5 fig, 3 tab, 14 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Planning, Wildlife habitats, United States, *Outer Continental Shelf.

It may not be possible for the U.S. Fish and Wildlife Service to be completely prepared to respond to oil spills at every site where they might occur in the United States, but it is possible to take steps now in those areas where spills are most likely to occur. Service personnel who are located near key oil pollution areas can be assigned to prepare for and respond to pollution incidents; supplies can be stockpiled within easy transport distance to implement bird dispersal and other field actions; surrounding areas can be examined before pollution incidents to determine what locations are known to be particularly critical and should be protected first if threatened by oil; and good communications should be established with State agencies and private organizations that may respond to pollution incidents in these areas. Without such preparation, unnecessarily high direct waterfowl mortality may result and significant indirect fisheries and wildlife losses might result from destruction of important wildlife and fisheries food resources and contamination of breeding areas. The degree of effectiveness of Service actions will be limited considerably by the circumstances of the spill and the species and kinds of habitats involved. However preparations should be made to respond rapidly and effectively in many of these locations where oil spills happen frequently. (See also W79-03830)(Sinha-OEIS)
W79-03831

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAND AND FEDERAL RESPONSIBILITIES.
Environmental Protection Agency, Washington, DC.
R. E. Hess.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No. FWS/OBS/77-24, September 1977. p 23-28, 1 fig.

Descriptors: *Oil pollution, *Legislation, *Water pollution effects, *Planning, Hazards, Water quality control, Cleaning, Coasts, Estuaries, *Outer Continental Shelf, National Oil and Hazardous Substances Pollution Contingency Plan, Clean-up, Government coordination, Hazardous substances.

The National Oil and Hazardous Substances Pollution Contingency Plan provides for efficient, coordinated, and effective action to minimize damage from oil and hazardous substances discharges. Possibly, its most important aspect is that of specifying that there should be an On-Scene Coordinator (OSC) to serve as the single Federal executive agent on-scene to direct cleanup and removal operations. The plan accomplishes its purpose by establishing a flexible organization consisting of the OSC and advisory groups capable of providing expertise and assistance as required. Generally, Federal On-Scene Coordinators are furnished by the Coast Guard for the coastal waters, the Great Lakes, and ports and harbors, and by the Environmental Protection Agency (EPA) for inland waters. (See also W79-03830) (Sinha-OEIS)
W79-03832

CALIFORNIA'S RESPONSE TO POLLUTION INCIDENTS,
California State Dept. of Fish and Game, Long Beach.
W. H. Putman.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service, Biological Services Program Publication No. FWS/OBS/77-24, September 1977. p 33-36.

Descriptors: *California, *Oil spills, *Planning, Pollution abatement, Environmental effects, Governments, Water quality control, *Outer Continental Shelf, Pollution Contingency Plans

The California Oil Spill Contingency Plan reconciles any differences in emergency planning by providing the local governments with all the information developed by the Federal and State On-Scene Coordinators (OSC) and including them in the decisionmaking process at the operation centers. This is accomplished by the local government's preassigning a representative who will have the authority to speak for his community and to commit personnel, equipment, and facilities to help mitigate the pollution incident. He will also have the responsibility to keep his local levels of government informed of the corrective or contemplated actions agreed upon at the operations center. (See also W79-03830) (Sinha-OEIS)
W79-03833

INDUSTRY VIEWS AND RESPONSIBILITIES IN OIL SPILL/WILDLIFE OPERATIONS,
American Petroleum Inst., Washington, DC
K. G. Hay.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No. FWS/OBS/77-24, September 1977. p 37-42.

Descriptors: *Oil spills, *Water quality control, *Water pollution effects, Wildlife conservation, Legislation, Industries, Oil industry, Training, *Outer Continental Shelf, Cleanup.

Most oil spills--large or small--are directly attributable to human error. The most effective means of preventing spills, therefore, is to employ skilled and attentive crews. To this end, oil companies have developed innovative training programs. The oil industry has conscientiously sought to control and clean up spills and is spending millions of dollars each year on new technologies and training programs to improve tanker efficiency and to reduce the potential for accidents. The petroleum industry has long supported legislation for the establishment of a huge 'superfund,' which could be used immediately to handle expenses involved in the cleanup of spills. The fund would be replenished by the spiller. The American Petroleum Institute (API) has initiated various research projects and other efforts to solve the many complex biological problems that occur in achieving high bird survival levels and a rapid return to the wild and reasonable costs. (See also W79-03830) (Sinha-OEIS)
W79-03834

FATE OF OIL IN THE SEA,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5C.
W79-03835

ASSESSING THE BIOLOGICAL IMPACT OF OIL SPILLS: A NEW ROLE FOR EPA BIOLOGISTS,
Environmental Protection Agency Edison, NJ.
For primary bibliographic entry see Field 5C
W79-03836

EFFECTS OF OIL ON AQUATIC BIRDS,
Fish and Wildlife Service, Laurel MD. Patuxent Wildlife Research Center
For primary bibliographic entry see Field 5C
W79-03837

CONTAINMENT AND RECOVERY TECHNIQUES FOR SPILLED OIL IN THE MARINE ENVIRONMENT,
National Coastal Ecosystems Team, NSTL Station, MS.
M. J. Donohoe.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No FWS/OBS/77-24, September 1977. p 69-82, 15 fig

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution treatment, Environmental effects, Skimming, Equipment, Water quality control, *Outer continental shelf, *Oil recovery, Containment.

The containment and recovery of oil discharges through the use of commercially available equipment has resulted in a more timely and efficient response to spill incidents. Appropriate materials or devices are available for use in local conditions throughout the United States. Knowledge of specific equipment limitations and appropriate techniques will result in overall minimization of adverse environmental damage as a result of a spill incident. The fact that one must be prepared to act rapidly, evaluating and programming responses prior to real incidents, is without doubt the most important 'technique' for the containment and recovery of oil spills in the marine environment. (See also W79-03830) (Sinha-OEIS)
W79-03838

CHEMICAL OIL DISPERSING AGENTS AND THEIR FEASIBILITY FOR USE,
Exxon Research and Engineering Co., Florham Park, NJ
G P Canevari.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No NWS/OBS/77-24, September 1977. p 83-94, 4 fig, 1 tab, 8 ref.

Descriptors: *Oil spills, *Water pollution treatment, Pollution abatement, Dispersion, Equipment, Mixing, Surfactants, *Outer Continental Shelf, Chemical dispersants.

There is increased recognition that there is a role for chemical dispersants in minimizing damage from oil spills. The improved effectiveness afforded by the self-mix dispersant system has been demonstrated. In addition, several organizations are planning major field demonstrations of this type of dispersant system. In these experiments, the water column will be sampled in the environs of the dispersed oil in order to establish the rate of dilution of oil concentration. The resolution of this important aspect (i.e., the dilution and resultant toxicity of dispersed oil) will help place the various laboratory bioassays, wherein dilution of the dispersed oil concentration is not considered, in a more proper perspective. Conventional (mixing required) dispersants will continue to be used in the immediate future where mixing energy is conveniently available and the spill size is relatively small. Hardware (sprays, booms, mixing breaker boards, etc.) have been well-developed for boat applications. In this regard, some dispersants are now formulated as concentrates (High surface-active agent content) for greater oil-to-chemical treatment ratios, thereby permitting workboats to

remain on station longer before having to replenish supplies. (See also W79-03830) (Sinha-OEIS)
W79-03839

RESTORATION OF OIL-CONTAMINATED SHORELINES,
URS Co., San Mateo, CA.
R. W. Castle.
In: Proceedings of the 1977 Oil Spill Response Workshop, held Metairie, LA on 15-17 February 1977, Fish and Wildlife Service Biological Services Program Publication No FWS/OBS/77-24, September 1977. p 105-112, 2 ref.

Descriptors: *Oil spills, *Beaches, *Shores, *Coasts, *Water pollution effects, Environmental effects, Sediments, *Outer Continental Shelf, Cleanup.

With the possible exception of the use of heavy equipment for sandy beach cleaning, a definitive and effective state-of-the-art for restoration of oil-contaminated shorelines is nonexistent. However, common sense applications of the knowledge and resources that are presently available can provide acceptable interim actions. Each restoration situation has its own peculiarities and requirements. If several basic assumptions are adhered to, the best practical restoration decisions should result. These assumptions include: any activity will have some effect on the environment. The restoration procedure and supporting activities (i.e., access, disposal, etc.) must not result in more environmental damage than caused by the oil itself. The restoration procedure should remove (or move to a position where recovery is possible) a maximum amount of contaminant with a minimum amount of disturbance, modification, or removal of the habitat. Extensive efforts resulting in low recovery yields are generally antiproductive and should be avoided. In some cases, no action at all is a viable alternative. (See also W79-03830) (Sinha-OEIS)
W79-03840

ECONOMIC ANALYSIS, ROOT CONTROL, AND BACKWATER FLOW CONTROL AS RELATED TO INFILTRATION/INFLOW CONTROL,
American Public Works Association, Chicago, IL.
R. H. Sullivan, R. S. Gemmell, L. A. Schafer, and W. D. Hurst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 052, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-77-017a, December 1977. 102 p, 17 fig, 13 tab, 17 ref. 803151.

Descriptors: *Root control, *Backwater, *Roots, *Tide gates, *Sewers, *Costs, Sewerage, Cost-effectiveness, Economics, Infiltration, Inflow, Root systems, Flooding, Herbicides, Vaporooter, Mechanical control, Chemcontrol, Pipes, Backwater gates, Manholes.

On-site investigations and questionnaires were used to compile information (including costs) on control and elimination of infiltration/inflow flows to sanitary sewer systems. Major sources of infiltration are pipe defects, manholes, service connections, and poor initial construction. Major inflow sources are open manholes, roof leaders, illegal connections, catch basins, and yard and ground drains. It is seldom cost-effective to correct all infiltration points and some types of inflow. Intrusion of tree and shrub roots is a major sewer system problem. Mechanical cleaning is initially effective, but seems to cause worse root problems later. Of chemical control methods, Vaporooter is the most effective and is considered safe for employees and surface plants with recommended precautions. Foam also appears effective, but flooding or application of chemicals through manholes are not recommended. Roots can be excluded by use of newly developed pipe and sealer designs. Tide gates are considered satisfactory, though frequent maintenance is required to correct fouling and sticking, which represent about 60% of malfunctions. Only 7% of gate failures are reported due to corrosion. A major problem is accessibility. Cast iron gates have a longer service life than timber gates and steel pontoon gates, which decay or corrode after about 10 years. Three additional volumes (Appendices, Product and Equipment Guide, and Manual of Practice) accompany this report. (Lynch-Wisconsin)
W79-03841

PERMISSIBLE POLLUTION LEVELS OF WATER BODIES,
Moscow State Univ. (USSR). Dept. of Biology.
N. S. Stroganov.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Volume I, Environmental Protection Agency, Report EPA-600/3-78-076, p 1-10, 1978. 3 fig, 1 tab.

Descriptors: *Water quality standards, *Water quality control, *Self purification, *Waste assimilative capacity, USSR, Baseline studies, Water quality, Water chemistry, Microorganisms, Industrial wastes, Chemical wastes, Nitrification, Microbial degradation, Chemical degradation, Biochemical oxygen demand, *Mineralization.

In order to establish the maximum permissible level of pollution, beyond whose limits one cannot go without disrupting the use of the water, one should: first, determine the chief water users for multiple utilization of the water body, and, secondly, determine the main water quality requirements. The maximum permissible level of pollutant emission is limited by the water body's processes of self-purification, especially microorganisms. Their capability and the rate of decomposition of pollutants must be appropriate to the quality and quantity of pollutants discharged. (See also W79-03906) (EIS-Deal)
W79-03907

A BRIEF HISTORY OF WATER POLLUTION RESEARCH IN UNITED STATES,
C. M. Tarzwell.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1, Environmental Protection Agency, Report EPA-600/3-78-076, p 11-31, 1978.

Descriptors: *Water quality standards, *Water quality control, *Regulation, Bioindicators, Bioassay, Legislation, Water Quality Act, Water quality, Federal Water Pollution Control Act, Fish populations, Toxicity, Research and development, Waste treatment, Self-purificaton, Public health, Aquatic populations, Water supply, Disinfection, Water treatment.

The research for detection, evaluation, and abatement of water pollution is described under five major headings: (1) water supply studies; (2) pollution surveys and studies of natural purification and biological indicators of pollution; (3) treatment of organic wastes; (4) development, use, and standardization of bioassay methods; and, (5) determination of water quality requirements for aquatic life and development of water quality standards. Early developments are discussed in detail. Description of developments since 1948 are largely confined to legislative activities aimed at water pollution. (See also W79-03906) (EIS-Deal)
W79-03908

THE ROLE OF ALGAE IN THE POLLUTION OF RESERVOIRS AND PROBLEMS OF CONTROLLING THEIR NUMBERS,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W79-03914

EUTROPHICATION IN THE UNITED STATES: PAST-PRESENT-FUTURE,
A. F. Bartsch, K. W. Malueg, C. F. Powers, and T. E. Maloney.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. 1. Environmental Protection Agency, Report EPA-600/3-78-076, p. 87-104, 1978. 4 fig, 9 ref.

Descriptors: *Eutrophication, *Lakes, *Limnology, Nutrients, Algae, Algal control, Zooplankton, Water chemistry, Water analysis, Nutrient removal, Water quality, Water quality control, Productivity, Trophic level, Nitrogen, Phosphorus, Algicides, Biocontrol, Water quality standards.

First, a brief history of cultural eutrophication and attempts at analysis and correction is presented. Second, present techniques of analysis and control are discussed. Particular attention is given to the carbon problem, nutrient loading, algal assays, product modification, in-lake treatment and legislation. Lastly, areas of deficient knowledge are pointed out for future research. (See also W79-03906) (EIS-Deal)
W79-03915

THE IMPORTANCE OF TROPHIC BONDS IN THE BACTERIAL DESTRUCTION OF ORGANIC MATTER,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W79-03919

FISH-POPULATION STUDIES IN THE OHIO RIVER,
For primary bibliographic entry see Field 5C.
W79-03921

SEA LAMPREY (PETROMYZON MARINUS LINNAEUS) IN THE SAINT LAWRENCE GREAT LAKES OF NORTH AMERICA: EFFECTS, CONTROL, RESULTS,
For primary bibliographic entry see Field 5C.
W79-03925

PRINCIPLES AND METHODS OF BIOLOGICAL ESTABLISHMENT OF THE NORMS OF CHEMICAL SUBSTANCES AND EVALUATION OF THE LEVEL OF POLLUTION IN WATER-BODIES,
Tsentralnyi Nauchno-Issledovatelskii Inst. Osetrovog Khozyaistva, Astrakhan (USSR).
V. I. Lukyanenko.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 28-38, 1978, 11 ref.

Descriptors: *Water pollution effects, *Monitoring, *Standards, *Toxicity, Industrial wastes, Domestic wastes, Bioassays, Methodology, Public health, Commercial fisheries, Insecticides, Pesticides, Water quality, Ecology, Aquatic toxicology, Fish physiology, Animal behaviour.

The principles and methods for establishing biological standards for chemical substances discharged into water are considered. The methods of evaluating the level of pollution in water bodies require further development. (See also W79-03906) (EIS-Katz)c
W79-03929

A RESEARCH SYSTEM FOR DEVELOPING FISHERIES STANDARDS FOR WATER QUALITY, CONSIDERING THE PECULIARITIES OF TRANSFERRING EXPERIMENTAL DATA TO NATURAL WATER BODIES,
L. A. Lesnikov.
In: Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems - Vol. II, Environmental Protection Agency, Report EPA-600/3-78-076, p. 83-91, 1978. 3 tab., 18 ref.

Descriptors: *Daphnia, *Standards, *Monitoring, Phytoplankton, Zooplankton, Freshwater fish, Toxicity, Mortality, Benthos, Freshwater fish, Bioassays, U.S.S.R., Fisheries statistics, Water pollution effects, Methodology.

The author describes the consideration involved in using laboratory data and other biological data to develop standards for the protection of water bodies of the USSR. Data obtained with bioassays with algae, zooplankton, phytoplakton, zoobenthos, fish and reducing bacteria are used. (See also W79-03906 (EIS-Katz)
W79-03933

NATIONAL CONFERENCE ON MANAGEMENT OF NITROGEN IN IRRIGATED AGRICULTURE.
Proceedings of National Conference held in Sacramento, California, May 15-18, 1978. Sponsored by National Science Foundation, Environmental Protection Agency, University of California. Published by the Department of Soil and Environmental Sciences, University of California, Riverside, 1978. 442 p. $13.00.

Descriptors: *Nitrogen, *Nitrogen cycle, *Nitrates, *Irrigated land, Water quality, Water management(Applied), *Conferences.

These proceedings represent a National Conference on Nitrogen Management in Irrigated Lands, designed to bring together users representing a diversity of interests throughout the country for an integrated review of the findings from the comprehensive national research effort. The accumulated information needs to be utilized as fully as possible by the many individuals and organizations making decisions in current water quality planning. This will help ensure the emergence of appropriate and viable solutions to our water quality problems--solutions that are sensitive to both local and national needs and priorities. (See W79-03942 thru W79-03959) (Skogerboe-Colorado)
W79-03941

NITROGEN FORMS AND CYCLING IN RELATION TO WATER QUALITY,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
R. G. Menzel.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 33-52, 1978. 3 tab, 43 ref.

Descriptors: *Water quality, *Nitrogen, Nitrogen compounds, *Nitrogen cycle, Nitrogen fixation, Denitrification, Eutrophication.

The intended use of water determines the significance of various forms of nitrogen in water quality. Upper limit concentrations have been recommended for several forms of nitrogen in water used for public water supplies, freshwater aquatic life, marine aquatic life, and agricultural uses. The concentrations are lowest for cyanide, and increase in the order ammonium, nitrite, and nitrate. Nevertheless, nitrate is more often of concern in water quality than are the first three forms of nitrogen. Much of the total nitrogen in surface waters occurs in particulate or dissolved organic forms. Plant growth is often excessive when the total nitrogen concentration exceeds 0.5 mg/l if other nutrients are adequately supplied and growth conditions are favorable. Nitrogen supply limits growth in many ocean areas and in a few lakes, mainly eutrophic ones. Nitrogen fixation by blue-green algae tends to correct nitrogen deficiencies. Denitrification by bacteria tends to correct excesses. These features indicate that high nitrogen concentrations may be an effect, rather than a cause, of eutrophication. (See also W79-03941) (Skogerboe-Colorado State)
W79-03943

SOURCES OF NITROGEN FOR CROP UTILIZATION,
Potash/Phosphate Inst. Manhattan, KS.
L. S. Murphy.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 61-107, 1978. 23 tab, 40 ref.

Descriptors: *Nitrogen, Fertilizers, *Crop production, Nitrogen fixation, Corn(Field), Soybeans, Alfalfa, Symbiosis, Ammonium compounds, *Irrigation water, Water pollution control.

Nitrogen fertilization of crops is essential for maximum food production. Nitrogen from organic matter in the soil declines with continued cultivation to the point that supplemental nitrogen applications are necessary. Supplemental sources of nitrogen for crop production include symbiotically fixed nitrogen from legumes, nonsymbiotically fixed nitrogen from free-living organisms in the soil, inorganic nitrogen from lightning discharges and industrial emissions, industrially fixed nitrogen and nitrogen from various waste products. Recommendations for nitrogen applications in either dryland or irrigated agriculture are based on crop need as determined by agricultural research. Soil analysis is an important tool in determination of needs. Use of present and future recommendations will both maximize production of food and maintain environmental quality. (See also W79-03941) (Skogerboe-Colorado State)
W79-03944

MINERALIZATION, IMMOBILIZATION AND NITRIFICATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2K.
W79-03945

REMOVAL OF NITROGEN BY VARIOUS IRRIGATED CROPS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W79-03946

VOLATILE LOSSES OF NITROGEN FROM SOIL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3F.
W79-03947

LEACHING OF NITRATE FROM SOILS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
B. L. McNeal, and P. F. Pratt
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 195-230, 1978. 4 fig, 5 tab, 35 ref.

Descriptors: *Nitrates, Nitroge, *Leaching, Irrigated land, Denitrification, Waste disposal, Soils.

Calculation of soil solution nitrate concentrations, and of mass emissions of nitrate, are illustrated. Estimation of average water flux from nitrate/chloride ratios, and from drain field outflows, are discussed. The high potential for nitrate leaching from irrigated animal and municipal waste disposal sites is mentioned, with stress being placed on the high denitrification potential at many such sites, because of high soluble carbon loadings, high soil microbe levels, and rapid oxygen depletion. Root-zone and subsoil nitrate-nitrogen values are provided for typical croplands of southern California and central Washington. Such values are related to irrigation management and to downward water flux. Crop differences in ability to utilize all soluble nitrate from the soil solution are stressed, and some management alternatives for preventing deep percolation losses of nitrate are detailed. Predictions of nitrate leaching losses from data for nitrogen application rate and drainage water volume are discussed. Typical predictions are presented and are compared to experimentally-measured values. Overprediction of nitrate leaching estimates for some furrow-irrigated tracts in the Pacific Northwest is demonstrated. (See also W79-03941) (Skogerboe-Colorado State)
W79-03948

EFFECT OF WATER MANAGEMENT ON NITRATE LEACHING,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 3F.
W79-03949

MONITORING WATER FOR NITROGEN LOSSES FROM CROPLANDS,
California Univ., Davis. Dept. of Land, Air and Water Resources.
K. K. Tanji.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p. 251-263, 1978. 10 ref.

Descriptors: *Nitrogen, *Return flow, Irrigated lands, *Monitoring, Water quality.

This paper reviews monitoring for nitrogen in surface and subsurface return flows from irrigated lands. Presented are the elements of a monitoring program: objectives of monitoring, parameters to be measured, sampling programs that include site selection, sampling frequency and sampling method, laboratory methods for nitrogen determinations, requirements for resources and facilities, evaluations of collected data and other supporting information and data, and dissemination of monitored results. Each of these elements are appraised and a conclusion is drawn on monitoring waters for nitrogen losses from croplands. (See also W79-03941) (Skogerboe-Colorado State)
W79-03950

ESTIMATING THE INFLUENCE OF SOIL RESIDENCE TIME ON EFFLUENT WATER QUALITY,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
W. A. Jury.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 265-290, 1978. 6 fig, 1 tab, 30 ref.

Descriptors: *Effluents, *Water quality, Travel time, Drainage, Tile drainage, Nitrates, Soils.

Models are proposed to calculate the time required for dissolved chemicals to move from the soil surface to either underlying groundwater in the case of free drainage or to tile drain outlets in the case of artificial drainage. The models assume that dissolved substances are transported primarily by moving soil solution, which displaces soil water initially present in the wetted pore space (piston flow approximation). For free drainage, this results in a single travel time equation which is a function of soil water content and drainage volume. For tile drainage, the travel time depends also on the surface entry point, which is illustrated with a graph showing residence time as a function of place of origin. This graph may be used for all tile drain systems. Calculations are presented to show the influence of travel time on drainage concentrations, illustrating also how tile drain concentrations are a mixture of contributions from different parts of the field arriving at different times. Field studies of salt movement are analyzed and compared to the model predictions, with differences explained on the basis of soil variability or stagnant water in part of the wetted pore space. (See also W79-03941) (Skogerboe-Colorado State)
W79-03951

USE OF MATHEMATICAL RELATIONSHIPS TO DESCRIBE THE BEHAVIOR OF NITROGEN IN THE CROP ROOT ZONE,
Florida Univ., Gainesville. Dept. of Soil Science
For primary bibliographic entry see Field 3F.
W79-03952

DIAGNOSTIC TECHNIQUES USED TO IDENTIFY OPTIMUM LEVELS OF NITROGEN FERTILIZATION FOR IRRIGATED CROPS.
Oregon State Univ., Corvallis. Dept. of Soil Science
For primary bibliographic entry see Field 3F
W79-03953

ECONOMIC CONCEPTS AND POLICIES RELATED TO CONTROLLING NON-POINT SOURCE POLLUTION STEMMING FROM AGRICULTURE,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
N. K. Whittlesey, and P. W. Barkley.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 333-353, 1978. 14 ref.

Descriptors: Pollution abatement, Water pollution sources, Agriculture, *Nonpoint pollution sources, Water pollution control.

This paper describes the role of economics in solving non-point source pollution problems in terms that are understandable for the noneconomist. An economist attempts to watch over the process of converting natural resources into marketable commodities to assure that the process achieves the greatest possible good for members of society. Economic tools are well equipped to handle this process for goods and resources known as private property, those items used exclusively by the individual owners. Unfortunately, most pollution problems occur through the use and misuse of public property, those items owned and used jointly by all members of society. Air and water are the most common examples of public property. The paper describes economic concepts and public policies that are useful for internalizing the costs caused by pollution and abating or solving pollution caused problems. The concepts of opportunity cost and income distribution and their role in pollution abatement are discussed. Methods of choosing levels of abatement include the extremes of zero pollution and that which can be achieved by best management practices. The economic and social optimum probably lies between these extremes. Arbitrary standards are sometimes imposed as a compromise between the extremes of zero pollution and no abatement in an effort to approximate optimal levels of abatement. (See also W79-03941) (Skogerboe-Colorado State)
W79-03954

A CASE STUDY-NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5B.
W79-03955

ECONOMIC IMPACTS OF CONTROLLING NITROGEN CONCENTRATION AND OTHER WATER QUALITY DETERMINANTS IN THE YAKIMA RIVER BASIN,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
G. H. Pfeiffer, and N. K. Whittlesey.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 415-442, 1978. 4 fig, 4 tab, 9 ref.

Descriptors: Water quality, *Nitrogen, *Economic impact, *Return flow, Pollution abatement, *Washington, *Yakima River Basin(Wash).

The nonpoint source nature of water quality degradation caused by irrigation return flow makes control nearly impossible with traditionally effective measures, such as limitations or taxes on effluents. As a consequence, control or taxation of those inputs to production which are involved in effluent input-output relationships is a possible alternative. In the Yakima River Basin, three determinants of river water quality were identified: nitrogen concentration, river water temperature, and soil erosion by irrigation water. Among the pollution control policies considered for effectiveness, producer cost, and social cost were taxation of nitrogen fertilizer, increasing the charge for irrigation water, reduction of irrigation water rights, and restrictions on the types of irrigation systems used. Results showed that policies which affect the level of one pollutant may or may not significantly affect the levels of others. Furthermore, policies taxing or charging for inputs, such as fertilizer and irrigation water, cause a substantial reduction in producer income if acceptable water quality is to be attained. Therefore, water quality policy formulation and evaluation should consider the interactions which exist among water quality determinants and considerations of both the expected benefits of improved water quality and the level and distribution of improvement costs. (See also W79-03941) (Skogerboe-Colorado State)
W79-03956

NITROGEN BALANCES FOR THE SANTA MARIA VALLEY,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
L. J. Lund, J. C. Ryden, R. J. Miller, A. E. Laag, and W. E. Bendixen.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p. 395-413, 1978. 6 tab, 7 ref.

Descriptors: *Nitrogen, Nutrient removal, Denitrification, Vegetable crops, Leaching, *Santa Maria Valley(Calif), *California model studies.

A simplified steady-state model has been used to develop nitrogen balances in the Santa Maria Valley, California. Balances have been developed for selected management units and for the valley as a whole. The balance developed for a field cropped with vegetables for the past twelve years showed that 30% of the applied nitrogen was removed in harvested crop, 37% was leached below the root zone and 33% was unaccounted-for, which was attributed to gaseous losses of nitrogen as products of denitrification. Direct field measurement of denitrification over an eight-month period at one site in the same field found a 29% loss of the applied nitrogen. The first estimation of the nitrogen balance in the valley attributed 24% of the applied nitrogen to removal in harvested crops, 39% to leaching and 37% to denitrification. (See also W79-03941) (Skogerboe-Colorado State)
W79-03957

AN ECONOMIC METHODOLOGY FOR EVALUATING 'BEST MANAGEMENT PRACTICES' IN THE SAN JOAQUIN VALLEY OF CALIFORNIA,
Economics, Statistics, and Cooperatives Service, Washington, DC.
G. L. Horner, D. J. Dudek, and R. B. McKusick.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 369-393, 1978. 1 fig, 1 tab, 20 ref.

Descriptors: Return flow, *Economic prediction, Water quality, *Management, Environmental effects, Economics, *Methodology, *California, *San Joaquin Valley(Calif).

Section 208 of Public Law 92-500 (The Federal Water Pollution Control Act Amendments of 1972) requires the preparation of areawide waste treatment management plans. Agricultural related pollutants such as subsurface drainage water and irrigation tailwater containing nutrients, sediment and pesticides must be identified and procedures and methods to control such discharges specified. Under Section 208, the reduction of pollutants may be achieved by adopting a set of 'best management practices' that could include varying economic incentives, establishing resource use controls and suggesting public resource investment. To determine the economic and environmental impact of 'best management practices,' a methodology must be derived that specifies the relationship of agricultural production practices to water and land quality and the economic cost and benefits of changing those practices. Such a methodology is being developed to systematically collect and organize physical and economic data, specify the physical and economic relationships and estimate the changes in agricultural production, income, employment and resource demands from proposed 'best management practices.' (See also W79-03941) (Skogerboe-Colorado State)
W79-03958

OVERVIEW OF NITROGEN IN IRRIGATED AGRICULTURE,
California Univ., Davis. Cooperative Extension.
R. S. Rauschkolb.
In: National Conference on Management of Nitrogen in Irrigated Agriculture, p 53-60, 1978. 3 ref.

Descriptors: Water quality, *Nitrogen, *Pollution abatement, Pollutant identification, Fertilization, Water management(Applied), *Irrigated land, Water law.

Events of the recent past have been moving agriculture rapidly towards the point where it can no longer afford the luxury of being concerned with production of food and fiber alone. One of the principle reasons for the change in attitudes has been the Federal Water Pollution Control Act Amendment of 1972, commonly referred to as Public Law 92-500. Within this law there is a section dealing with areawide planning, Section 208. Under this section each state is to develop waste water management strategies which indicate methods for control or treatment of all point and nonpoint sources of pollution within an area. Specific outputs resulting from Section 208 area-wide planning include a regulatory program to control or treat all point and nonpoint pollution sources, including in-place or accumulated pollution sources. This represents only one of the many outputs that are expected from area 208 planning, but it is one that seems to be the most important with respect to nitrogen management in irrigated agriculture. (See also W79-03941) (Skogerboe-Colorado State)
W79-03959

SAND AND GRAVEL OFFSHORE IN THE GREATER NEW YORK METROPOLITAN AREA: WHAT KIND AND HOW MUCH,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2L.
W79-03963

POLLUTION CONTROL GUIDELINES FOR COAL REFUSE PILES AND SLURRY PONDS.
Wahler (W. A.) and Associates, Palo Alto, CA.
Report No. EPA-600/7-78-222, November 1978. 223 p, 66 fig, 49 tab, 24 ref, 2 append. 68-03-2344, 68-03-2431.

Descriptors: *Coal mine wastes, *Waste disposal, *Water pollution sources, *Reclamation, *Pollution abatement, Water pollution control, Mine acids, Settling basins, Waste dilution, Sediment transport, Sediment discharge, Sediment load, Vegetation effects, Publications, Technology, Sampling.

A study undertaken to develop guidelines for construction, operation, and reclamation of coal refuse piles and slurry ponds is reported. Detailed air and water quality sampling programs were carried out at eight active refuse pile sites and six slurry pond sites in the eastern coal-mining regions. Information is presented on: pollution mechanism; the physical and chemical properties of coal refuse; coal preparation plant processes and procedure; site selection; conveyance systems for transporting refuse from plant to disposal area; and site abandonment and reclamation. Alternative techniques for refuse disposal and pollution control applicable to specific situations are discussed. It was generally concluded from the literature search, interviews and the field study program that technology is currently available for the construction of refuse disposal and reclamation facilities which can operate in an environmentally acceptable manner. (Davison-IPA)
W79-03968

SOURCE ASSESSMENT: OPEN MINING OF COAL, STATE OF THE ART,
Monsanto Research Corp., Dayton, OH.
S. J. Rusek, S. R. Archer, R. A. Wachter, and T. R. Blackwood.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 497. Price codes: A06 in paper copy, A01 in microfiche.

Report No. EPA-600/2-78-004X, September 1978. 86 p, 11 fig, 10 tab, 59 ref, 3 append. 68-02-1874.

Descriptors: *Air pollution, *Coal mines, *Pollution abatement, *Reviews, *Strip mines, Air pollution effects, Hazards, Pollutant identification, Drilling equipment, Overburden, Wind erosion, Dusts, Safety.

The potential environmental effects of atmospheric emissions from the open mining of coal are evaluated using source severity values. In open coal mining there are seven unit operations or subprocesses involving excavation of overburden, removal of the coal, and coal transport. The only hazardous emissions are respirable dusts which are generated by five of the subprocesses and wind erosion. Total dust loading from these sources are: coal transport and unloading, 40%; blasting, 30%; coal loading, 14%; drilling, 12%; coal augering, 1%; and wind erosion, 3%. The emission factors for the unit operations indicate that 13 g of respirable dust are emitted per metric ton of coal mined. Control technology has been effected for drill rigs, haul roads and coal refuse piles. Cyclones and water sprays are employed on the larger drills to control particulates. Water spraying of haul roads for dust reduction and safety is enforced by most states. Gaseous pollutants from stagnant coal piles are controlled by shielding the piles from the wind, applying cooling process, or removing the carbonaceous material. Currently the open coal mining industry has a growth rate of 3.5%/year; the growth factor for the industry is 1.23. (Davison-IPA)
W79-03969

OHIO RIVER BASIN ENERGY STUDY, ORBES PHASE I: INTERIM FINDINGS,
Illinois Univ., Urbana-Champaign.
For primary bibliographic entry see Field 6G
W79-03971

PRELIMINARY ENVIRONMENTAL ASSESSMENT OF BIOMASS CONVERSION TO SYNTHETIC FUELS,
Battelle Columbus Labds., OH.
S. T. DiNovo, W. E. Ballantyne, L. M. Curran, W. C. Baytos, and K. M. Duke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 775, Price codes: A16 in paper copy, A01 in microfiche. Report No EPA-600/7-78-204, October 1978. 363 p, 70 fig, 121 tab, 261 ref. 68-02-1323.

Descriptors: *Biomass, *Fuels, *Municipal wastes, Aquaculture, Forestry, Hydrogenation, Hydrolysis, Environmental effects, Forest management, Energy conversion, Biochemistry, Agricultural wastes.

The technological aspects of biomass production and conversion and their associated environmental effects are examined. Details of five categories are given: (1) agricultural and forestry wastes; (2) aquaculture; (3) silviculture; (4) energy crops; and (5) urban and industrial wastes. The primary thermochemical processes reviewed in detail include direct conversion, pyrolysis, and acid hydrolysis, and the lesser developed technologies, hydrogenation and naval stores are briefly analyzed. The primary biochemical processes, anaerobic digestion and enzymatic hydrolysis, are detailed, and the secondary processes, methanol and other Fisher-Tropschtype products from synthesis gas, ethanol production from sugar solutions, and other minor process systems, are evaluated. A series of six regionalized scenarios which examine the environmental implications of different conversion technologies applicable to different geographical areas of the U.S. are presented. It is concluded that the development of biomass sources of synthetic fuels could potentially satisfy 3 to 8% of the projected U.S. energy demand by the turn of the century. However, the development of biomass sources should be in concert with localized energy needs. It is also concluded that since the development of biomass converson is in the early stages of development, technology and environmental protection can develop simultaneously. (Davison-IPA)
W79-03973

ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING, PART I: FISHES OF PICEANCE CREEK, COLORADO, PRIOR TO OIL SHALE PROCESSING,
Colorado Div. of Wildlife, Fort Collins. Fisheries Research Center.
For primary bibliographic entry see Field 5C.
W79-03974

ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING, PART II: THE AQUATIC MACROINVERTEBRATES OF THE PICEANCE BASIN, COLORADO, PRIOR TO OIL SHALE PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-03975

RESULTS OF RESEARCH RELATED TO STRATOSPHERIC OZONE PROTECTION, REPORT TO CONGRESS,
SRI International, Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W79-03977

SAMPLING AND ANALYSIS RESEARCH PROGRAM AT THE PARAHO SHALE OIL DEMONSTRATION,
TRW Environmental Engineering Div., Redondo Beach, CA.
For primary bibliographic entry see Field 5A.
W79-03980

LINERS FOR SANITARY LANDFILLS AND CHEMICAL AND HAZARDOUS WASTE DISPOSAL SITES,
Ebon Research Systems, Silver Spring, MD.
S. A. Ware, and G. S. Jackson.
Report No. EPA-600/9-78-005, May 1978. 92 p, 9 fig, 17 tab, 22 ref, 2 append. 68-03-2460-4.

Descriptors: *Landfills, *Linings, *Sewage lagoons, *Waste storage, Waste dumps, Chemical wastes, Municipal wastes, Hazardous wastes, Plastic films, Solid wastes, Holding ponds, Waste disposal, Ponds, Inhibitors.

Sanitary landfills, chemical and hazardous waste disposal sites, and holding ponds with an impermeable lining are identified, listed, and briefly described. The term 'liner' is defined as a variety of materials that can be installed at the base and around the perimeter of a sanitary landfill to prevent leachate from entering ground and surface waters and to impede migration of gases across the fill before venting to the atmosphere. Liners listed include polyethylene, chlorinated polyethylene, polyvinyl chloride, Hypalon R, ethylene propylene diene monomer, butyl rubber, conventional paving asphalt, hot sprayed asphalt, asphalt-sealed fabric, concrete and various treated and untreated soil mixtures, such as compacted clay, pure montmorillonite and montmorillonite mixed with concrete. Three methods are evaluated for excavating a fill to retrieve a small portion of liner for laboratory analysis: use of the dragline, the back hoe, and the caisson. Costs for each of the methods are given. (Davison-IPA)
W79-03985

MERCURY, LEAD, ARSENIC, AND CADMIUM IN BIOLOGICAL TISSUE. THE NEED FOR ADEQUATE STANDARD REFERENCE MATERIALS,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W79-03995

SIZE DEPENDENT MODEL OF HAZARDOUS SUBSTANCES IN AQUATIC FOOD CHAIN,
Manhattan Coll., Bronx, NY.
For primary bibliographic entry see Field 5C.
W79-03997

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL SEQUENCING FOR A MULTIPURPOSE WATER SUPPLY SYSTEM,
Banyaszati Kutato Intezet, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W79-03518

WATER RESOURCES CONTROL THROUGH SYSTEMS ANALYSIS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W79-03519

APPLICATION OF DECISION THEORY TO SALMON MANAGEMENT,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region).
S. W. Sheehan, and S. O. Russell.
Water Resources Research, Vol. 14, No. 5, p. 976-980, October 1978. 4 fig, 2 tab, 14 ref.

Descriptors: *Salmon, *Management, *Spawning, *Skeena River fishery(BC), Canada, Real time, Forecasting, Probability, Equations, Mathematical models, Systems analysis, *Bayesian decision theory, Utility curve, Escapement, Renewable resources.

Bayesian decision theory provides concepts that seem ideally suited to many renewable resource management problems. A procedure for applying the concepts to salmon management in real time is illustrated with an example from the Skeena River fishery in Northern British Columbia, Canada. The decision in question is the escapement to allow for spawning purposes in a particular year. The procedure involves determining a probabilistic relationship between the escapement in one year and the number of adults returning in the cycle year 4 years later, defining a utility curve for the catch, forecasting the number of salmon expected to return in the current year, and computing the escapement with the maximum expected utility. Discussion indicates areas where further work is needed and also other possible applications of the procedure. (Bell-Cornell)
W79-03522

METHODS FOR EVALUATING NONMARKET IMPACTS IN POLICY DECISIONS WITH SPECIAL REFERENCE TO WATER RESOURCES DEVELOPMENT PROJECTS,
Maryland Univ., College Park.
For primary bibliographic entry see Field 6B.
W79-03525

RECENT DEVELOPMENTS IN THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM AREA.
Army Engineer Div., Southwestern Dallas, TX.
For primary bibliographic entry see Field 4A.
W79-03526

METHODS FOR ESTIMATING AND PROJECTING WATER DEMANDS FOR WATER-RESOURCES PLANNING.
California Univ., Riverside
For primary bibliographic entry see Field 6D.
W79-03529

LEAST-COST DESIGN OF URBAN-DRAINAGE NETWORKS.
Washington Univ., Seattle. Dept. of Civil Engi-

neering.
For primary bibliographic entry see Field 5D.
W79-03533

LAND USE ALLOCATION MODEL FOR FLOOD CONTROL,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 4A.
W79-03534

REGIONAL ECONOMETRIC FORECASTING MODELS: A TEST OF STRUCTURAL GENERALITY, DISAGGREGATION EFFECTS, AND POLICY ANALYSIS POTENTIALS,
Wisconsin Univ.-Madison. Dept. of Urban and Regional Planning.
B. M. Rubin.
Available from University Microfilms International, Ann Arbor, MI 48106: Ph.D. Thesis, 1977. 255 p. 69 fig, 14 tab, 47 refs, 4 append. OWRT B-095-WIS(2) 14-34-0001-6133.

Descriptors: *Alternative costs, *Cost analysis, *Econometrics, *Economic impact, *Estimating, *Forecasting, *Model studies, *Wisconsin, *Milwaukee(Wisc).

Two general hypotheses were posed. The first was that the prototype structure for small area econometric models developed by Glickman (1971) and extended by Hall and Licari (1973) is general enough to be utilized for the Milwaukee regional economy with only slight modifications. The second hypothesis was that a regional econometric model having greater disaggregation and a structure developed in accordance with theoretical relationships would produce more reliable simulation and forecasting results than the more aggregated model. The model was developed with minor modifications designed to provide a better fit to the Milwaukee regional economy. This aggregate model, as did the Philadelphia prototype, contained four manufacturing and non-manufacturing sectors; equations are presented for output, employment, and wages, and a series of relationships for the derivation of such regional aggregate variables as Gross Regional Product, total employment, unemployment rate, income, population, consumer prices, government revenues and government expenditures. The results of the ex post (sample period) forecasts, as measured by mean absolute percent error, indicated that this aggregate model generally succeeded in simulating values of the actual data to a degree superior to that of the Philadelphia prototype. A comparison of the ex post forecasts of the Milwaukee model with those of the Los Angeles model reveals that the former more accurately simulates regional business cycles. From the results, it can be concluded that the aggregate Milwaukee econometric model provides a successful test of the generality of Glickman's Philadelphia prototype for small area econometric modeling.
W79-03593

ON THE THEORY AND MODELING OF DYNAMIC PROGRAMMING WITH APPLICATIONS IN RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W79-03671

A STUDY OF INTERESTED AND ACTIVE PARTIES CONCERNED WITH WATER RESOURCE MANAGEMENT IN WASHINGTON STATE: IMPLICATIONS FOR A MANAGEMENT SYSTEMS MODEL,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W79-03693

CONTRIBUTED PAPERS ON COASTAL ECOLOGICAL CHARACTERIZATION STUDIES. FOURTH BIENNIAL INTERNATIONAL ESTUARINE RESEARCH FEDERATION CONFERENCE, OCTOBER, 1977.
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
For primary bibliographic entry see Field 2L.
W79-03697

COASTAL ECOLOGICAL CHARACTERIZATION-AN OVERVIEW,
National Coastal Ecosystems Team, NSTL Station, MS.
For primary bibliographic entry see Field 2L.
W79-03698

ECOSYSTEM CHARACTERIZATION-AN APPROACH TO COASTAL PLANNING AND MANAGEMENT,
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
A. W. Palmisano.
In: Contributed Papers on Coastal Ecological Characterization, Fourth Biennial International Estuarine Research Federation Conference, October, 1977. U. S. Fish and Wildlife Service, Office of Biological Servies, FWS/IBS-77/37, p 4-9, April, 1978. 4 fig.

Descriptors: *Coasts, *Ecosystems, *Systems analysis, Coastal plains, Structural models, Estuaries, Structure, Ecology, Land management, Simulation analysis.

The ecosystem characterization approach involves the delineation of the physical boundaries of the system, preparation of a functional conceptual ecosystem model, synthesis and analysis of existing information using the model as a blueprint, and the preparation of an interim pilot characterization report. The latter report, after review by the user group, will permit the effective production of the final ecosystem characterization report. During the process most of the relevant information about the system will be brought together in a data source appendix. Guidance throughout the project is provided by the user committee to assure that the information will meet action program needs. Ecosystem characterizations can provide an important ecological foundation from which to plan and manage out natural resources. (See also W79-03697)(Steiner-Mass)
W79-03699

EVALUATION OF METHODOLOGY USED IN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN,
National Coastal Ecosystems Team, NSTL Station, MS.
For primary bibliographic entry see Field 6B.
W79-03700

USER-ORIENTED CONCEPTUAL MODELING IN THE ECOLOGICAL CHARACTERIZATION OF THE SEA ISLANDS AND COASTAL PLAIN OF SOUTH CAROLINA AND GEORGIA,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
J. J. Manzi, and R. J. Reimold.
In: Contributed Papers on Coastal Ecological Characterization Studies, Fourth Biennial International Estuarine Research Federation Conference, October, 1977. U. S. Fish and Wildlife Service, Office of Biological Sciences, FWS/OBS-77/37, p. 19-31. 9 fig, 10 ref.

Descriptors: *Model studies, *Systems analysis, Estuaries, *Design, Coasts, Coastal plains, Ecology, Ecosystems, Simulation analysis, Evaluation, Design, Testing, Analysis, Wetlands, Coastal marshes, Swamps, *South Carolina, *Georgia.

A user-oriented system of access is presented that produces information as well as an ecological understanding of the various habitats comprising the study area. The system is composed of four major parts: an executive summary, models, habitat distribution of various species, and interaction matrices. The executive summary will provide an introduction to characterization concepts, a brief summary of the ecosystems, and instructions for data search and retrieval. Models are included to present the principal components of each ecosystem and their relationships. The four models compiled for the test area are: the marine subtidal system, the estuarine intertidal emergent wetland system, the riverine forested wetland system, and the upland pine forest system. The models are presented in a diagrammatic (energese) and a pictorial mode. The ecological sketches are brief narratives on high priority species, and summarize their reproductive and cover requirements, and impinging human activities. Finally, the interaction matrices will form the central component of the user system package Each ecosystem will be supported by a single matrix which cross-references common environmental alterations with existing environmental characteristics. Each intersection of the matrix will thus privide appropriate entry into the characterization products. (See also W79-03697) (Steiner-Mass)
W79-03701

MAINE COAST CHARACTERIZATION USER'S GUIDE,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W79-03703

6B. Evaluation Process

ALLOCATIONAL INEFFICIENCY OF BENEFIT/COST APPLIED TO WATER AND SEWERAGE SUPPLY: INTERACTIONS BETWEEN TIME-SERIES AND CROSS-SECTIONAL MODELS,
Pennsylvania State Univ., University Park. Dept. of Economics.
S. P. Coelen, R. W. Bahl, and J. J. Warford.
Water Supply and Management, Vol. 2, No. 3, p. 265-274, 1978. 1 fig, 3 tab, 11 ref, 13 ref.

Descriptors: *Water supply, *Sewerage, *Cost-benefit analysis, *Time series analysis, *Measurement, Methodology, Data collections, Investment, Effects, Equations, Mathematical models, System analysis, Property values, Empirical analysis, Environmental analysis, Cross-section data, Developing countries.

A fundamental problem of cost-benefit analysis is that benefit measurement is often difficult or impossible. These difficulties vary considerably between sectors, and thus estimated economic rates of return may allocate funds inefficiently across the sectors. Within the sectors, water supply and sewerage projects fare badly due to systematic underestimation. The central premise of this analysis is that unpaid-for benefits from investments in public sewerage and water facilities are reflected in increased land values. The basic theory of this paper is taken from earlier work, especially from Lind (1974) and Rosen (1974), which is extended here to show that (1) the land value approach is particularly applicable in the developing countries, (2) time-series techniques are as useful for measuring land value increments as the more traditional cross-sectional methods, and (3) water/sewerage projects do, in fact, have an impact on property Results obtained from using this modeling technique in a case study of Nairobi, Kenya are presented.
W79-03520

METHODS FOR EVALUATING NON-MARKET IMPACTS IN POLICY DECISIONS WITH SPECIAL REFERENCE TO WATER RESOURCES DEVELOPMENT PROJECTS,
Maryland Univ., College Park
K. Finsterbusch
IWR Contract Report 77-8, U S Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, December 1977 46 p, 4 fig, 2 tab, 64 ref

Descriptors: *Water resources development, *Projects, *Evaluation, *Non-market impacts, Decision making, Planning, Feasibility, Cost-benefit analy-

sis. Political aspects. River basins. Methodology. Water policy. Social impact. Comparative measurement. Goal programming. Weighting procedure. Systems analysis

Explored is the as yet intractable problem of accounting for non-market impacts in policy decisions, especially in the context of water resource development projects. The first section presents and critiques in general terms 19 methods. Included are common metrics, weighting schemes, discrete dimensions evaluation, methods utilizing public or political evaluations, and methods which obviate evaluation. In the second section, the social impacts of water resource projects are reviewed and related to the 19 valuation methods. In the final section, a number of critical issues involved in valuing non-market impacts are discussed, considering: priority of social criteria over engineering-economic criteria, the principle of justice; selection versus elimination; the human limits to evaluations, and building cummulation into evaluations through rationalized weights. (Bell-Graf--Cornell)
W79-03525

CLIMATE, CLIMATIC CHANGE, AND WATER SUPPLY.
National Research Council, Washington, DC.
For primary bibliographic entry see Field 2B
W79-03527

WATER-RESOURCE SYSTEMS PLANNING.
Geological Survey, Reston, VA.
N C Matalas, and M B Fiering
In: Climate, Climatic Change, and Water Supply. Studies in Geophysics, National Academy of Sciences, Washington, D C., p 99-110, 1977 (The National Research Council) 9 fig, 23 ref

Descriptors: *Water resources, *Planning, *Design, *Climatic change, *Economic regret, *Robustness, Forecasting, Calculus, Hydrologic systems, Optimization, Systems analysis, Mathematical models, Probability, Uncertainty, Regret minimization

Discussed is the calculus of economic regrets in water-resource design in light of possible procedural changes that could result from considering forecasts of climatic changes. It is emphasized that unless the exact sequence of future flows can be predicted with certainty, there may be little benefit to hydrologic system design of even an exact forecast of a change in one or more of the parameter values of the hydrologic input. To allow explicitly for climatic change in the design process, the concept of 'robustness' is introduced: A robust design may be optimal in the classical sense, but it will be a design which performs reasonably well under a variety of possible climates. The 'resilience' of an existing well-buffered water-resource system can be enhanced by changes in insurance, subsidies, zoning, water law, and price structures, as well as by additional structural measures, such as reservoirs or pipelines. Prolonged droughts could enhance conflicts between groups of water users. Referring to the Paretian frontier, it is hoped that resolution of such conflicts would be rational, with resulting tradeoffs acceptable to all. (See also W79-03527) (Bell-Graf-Cornell)
W79-03528

URBAN RUNOFF CONTROL MASTER PLANNING.
American Society of Civil Engineers, Marblehead, MA. Urban Water Resources Research Program.
M B McPherson
Journal of the Water Resources Planning and Management Division, Proceedings of American Society of Civil Engineers, Vol. 104, No. WR1, p. 223-234, November 1978. 4 fig, 49 ref

Descriptors: *Urban runoff, *Planning, *Land use, *Flood control, *Drainage, *Water balance, *Water pollution, *Economic analysis, *Models, Management, Costs, Cost-benefit analysis, Water resources, Control, Master plans, Public works, Systems analysis

The thesis of this paper is that rational planning requires conjunctive consideration of the quantity and quality aspects of urban runoff within a comprehensive, multiple-use framework. Explored are some of the more obvious arguments with reference to land-use factors, economic evaluations, flood control considerations, performance simulation, and metropolitan water resource inventories. There appear to be very few master plans extant that have integrated water quantity management with water quality management. Given the institutional constraints in metropolitan areas, perhaps the most that can be expected is adoption of an integrated, comprehensive, or systems approach to urban runoff planning. However, such an approach is subtle in a documentary sense, and more rational conjunctive master planning may be in progress than external indications seem to imply. (Bell-Cornell)
W79-03532

DELAWARE RIVER BASIN WATER RESOURCES MANAGEMENT.
Delaware River Basin Commission, Trenton, NJ
C. H. J. Hull
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 104, No WR1, p 157-174, November 1978. 2 fig, 4 tab, 35 ref

Descriptors: *Delaware River, *Flood control, *Water resources, *Water supply, *Water management(Applied), *Salinity, Planning, Estuaries, Water quality, Rivers, Water pollution, Multiple purpose, Delaware River Basin Commission, Tocks Island Lake project

The Comprehensive Plan (CP) for multipurpose development and management of water resources in the Delaware River Basin, under the first Federal-Interstate compact, is explained. The CP is a codification of administrative laws adopted by the Delaware River Basin Commission, and serves as a general guide for planning, development, and operation of water-related projects and facilities, both public and private, for water supply, water quality control, flood control, hydroelectric power generation, and recreation. The CP serves also a regulatory document to prohibit developments that do not conform to the adopted plan. The CP grows in scope almost monthly as the Commission adds new projects, policies, criteria, and standards. The CP, together with the basic statutory law, the Delaware River Basin Compact, provide the legal basis for regulatory control of water resources in the four-state, 13,000 square mile region. The CP includes the controversial Tocks Island Lake project, a multipurpose impoundment sited on a 37-mile reach of the Delaware River just downstream of the New York-New Jersey state boundary, which has been halted by opposition from environmental groups. (Bell-Cornell)
W79-03538

PUBLIC PROCESS PORTION OF IMPACTS ANALYSIS.
Parsons, Brinckerhoff, Quade and Douglas, Inc., Vienna, VA
For primary bibliographic entry see Field 6G
W79-03539

REGIONAL ECONOMETRIC FORECASTING MODELS: A TEST OF STRUCTURAL GENERALITY, DISAGGREGATION EFFECTS, AND POLICY ANALYSIS POTENTIALS.
Wisconsin Univ.-Madison. Dept. of Urban and Regional Planning
For primary bibliographic entry see Field 6A.
W79-03593

URBAN WATER RESOURCES POLICY ALTERNATIVES: A SOCIOLOGICAL ANALYSIS OF DIFFERENTIAL PERSPECTIVES.
Purdue Univ., Lafayette, IN. Dept. of Sociology and Anthropology
H R Potter, A K Taylor, and G M Grossman
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 583. Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Purdue University Technical Report No. 106. December 1978. 35 p, 23 tab, 2 ref, 1 append. OWRT C-6106 (5213)(7).

Descriptors: *Water Resources Development, *Urban drainage, *Floodplains, *Ditches, *Social participation, Canals, Conduits, Pipes, Sewers, Subsurface drains, Attitudes, Urban sociology, Institutions, *Urban Water Resources, *Retention basins, *Public participation.

The purpose was to examine the acceptability to community leaders and the general public of selected urban water resources policy alternatives. The orientation is methodological; using the survey method, questions are deliberately varied in generality-specificity, and comparisons are made on the effect of experience with water problems and location of residence (urban, transitional, rural) on acceptability of alternative solutions. Data are from personal interviews with 46 leaders and a sample of 139 other residents of Tippecanoe County, Indiana. Asking more specific questions produced greater indications of concern with the environment and water pollution. Many of the differences between leaders and nonleaders were small; however, some important differences were found. For example, although leaders view themselves as more conservative, they were more liberal on some policy issues, e.g., willingness to pay more to combat water pollution and a firm policy to prevent building in wetlands. Only limited differences were found across residential location with wetlands policy being a specific example of a substantial difference. Respondents expressed considerable concern over two drainage alternatives: retention basins and open ditches, whether they had direct experience with them or not. They also expressed a strong belief in citizen participation and a preference for local government involvement in policy decisions.
W79-03660

INTERREGIONAL IMPACTS OF ALTERNATIVE WATER POLICIES FOR IRRIGATION IN THE WESTERN UNITED STATES: A QUANTITATIVE ASSESSMENT.
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
N L Meyer
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 667. Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, 1974. 191 p, 10 fig, 15 tab, 57 ref, append. OWRT B-057-WIS(5), 14-31-0001-3354.

Descriptors: *Regional economics, *Regional development, Water resources development, *Water distribution, *Farm management, *Crop production, *Sweet potatoes, *Transportation, *Alternative planning, *Water policy

An evaluation framework was developed which permits measuring the interregional effects that would result from water resource projects in the West. Further, the framework facilitates identification of intraregional shifts associated with project induced interregional impacts. Impacts of four water policies were considered. Alternative water policies are: (1) continue present policy, (2) cease new construction and honor existing contracts on present projects, (3) build new water projects only if they can repay the cost of delivering water for both new and existing projects. Each policy change was evaluated by region with respect to changes in acreage, total revenue, farm revenue, processing revenue, and transportation revenue. Aggregate changes in farm, processing and transportation revenues were also shown. Fall potatoes were used as a vehicle for the analysis. Continuing present water policy would encourage expansion of acreage in areas utilizing subsidized water. Production would remain constant or decline in higher cost production areas. Continuing present pricing policies on existing projects and ceasing construction of new projects implies expanded production would have to be through technical change in water use or through increased acreage in regions not dependent on publicly subsidized water.
W79-03664

SUBJECTIVE ESTIMATION OF VARIABILITY,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
R. L. Fike.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-290 680, Price codes: A08 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 147p, 14 fig, 14 tab, bibliography, 3 append. OWRT B-043-ARIZ(26), 14-31-0001-5056.

Descriptors: *Attitudes, *Human behavior, Estimating, *Human perception, *Variability, *Estimate combination, Sample information.

Experimental research concerning perception and estimation of variability and the combination of variability estimates is reported. People's ability to perceive variability, as shown by their ability to make correct discrimination judgments among small visually presented samples drawn from populations with the same mean but with different variances, is nearly optimal. Experiments are reported which show that people are able to encode their perception of variability into quantitative estimates which are fairly accurate. The commonly reported 'hypercertainty' phenomenon, extreme overconfidence of underestimation of the variability, is found to be associated primarily with a complete lack of sample information on which the estimates can be based (e.g., almanac-type variables). A model of human performance, which is substantially different from the mathematically correct one, is proposed for tasks involving estimation of composite variability based on data about the component variables. It is concluded that, contrary to the indications of prior work, people are potentially able to perceive and estimate variability fairly accurately, especially if they have even a small amount of sample information.
W79-03665

PUBLIC PARTICIPATION IN 208 WATER QUALITY PLANNING: A CASE STUDY OF TRIANGLE J COUNCIL OF GOVERNMENT, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning; and North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 5G.
W79-03666

RESEACH ON MINNESOTA WATER PROBLEMS.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 9A.
W79-03674

WATER RESOURCE STANDARDS FOR SECOND HOME AND RECREATIONAL LAND DEVELOPMENT,
North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 5G.
W79-03675

COMBATING PHEASANT LOSSES IN THE COLUMBIA BASIN - WHERE DO WE GO FROM HERE,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
S. C. Matulich, and B. F. Wolfley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 608, Price codes: A02 in paper copy, A01 in microfiche. OWRT C-7165 (No. 6213)(3), 14-31-0001-6213.

Descriptors: *Irrigation projects, *Washington, *Pheasants, Recreation, Planning, *Columbia River Basin(Wash), Economic analysis, Cost analysis, *Income.

In the absence of apparent legal obligations which bind existing Columbia Basin irrigators to deliberately allocate resources toward pheasant production, provision of economic incentives is necessary to change the status of pheasant from an unintentional production alternative. The amount and type of resources farmers will voluntarily divert from cropping activities depends upon the economic incentives for wildlife production relative to other production possibilities. In the context of non-market goods such as pheasant (which are not bought and sold in the market place), incentives must equal or exceed the opportunity cost of their production. That is, incentives (compensation) required to shift resources to pheasant production must be at least equal to the income foregone from crop production. Provision of such incentives is justified if the benefits from additional pheasant equal or exceed the foregone farm income.
W79-03686

PHEASANT ENHANCEMENT POTENTIALS IN IRRIGATED AGRICULTURE: A CASE STUDY OF THE COLUMBIA BASIN,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
G. H. Bagwell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 556, Price codes: A06 in paper copy, A01 in microfiche. MA Thesis, 1978. 104 p, 14 tab, 37 ref, 4 append. OWRT C-7165 (No 6213)(4), 14-31-0001-6213.

Descriptors: *Pheasants, Irrigated agriculture, Wildlife managers, *Washington, *Columbia River basin(Wash), Management, Economic feasibility, Alternative costs.

Declining pheasant populations within irrigated agriculture have alarmed wildlife managers who began identifying methods of stabilizing and enhancing the pheasant population. The fundamental problem is that of allocating scarce resources between agriculture and wildlife. The overall objective of this study was to determine the opportunity costs of alternative pheasant enhancement practices, and to examine their potential economic feasibility within irrigated agriculture. Typical Columbia Basin farm operations were modeled into enterprise base budgets. Whoel farm costs and returns were estimated when enterprise budgets were aggregated by rotation to the farm level. Comparison of foregone income with pheasant response estimates provided an opportunity cost per bird. Analysis of alternative pheasant enhancement practices revealed a large deviation in opportunity costs per bird. Permanent cover crops in the form of strips and small-sized farms were found to provide least-cost enhancement. Generally, enhancement practices which generate large pheasant responses were associated with substantially higher per pheasant opportunity costs than low bird response enhancement practices. Comparison of the least cost enhancement practices with current Game Department costs of pen raising and releasing pheasants, and in consideration of additional values gained from establishing permanent habitat, pheasant enhancement in irrigated agriculture appears potentially feasible. Successful enhancement, however, is contingent upon farmers being compensated for lost income. Wildlife managers should direct enhancement strategies toward lower valued crops and smal farms liberalization of hunting regulations in enhanced areas; public access to enhanced areas must be assured.
W79-03687

A STUDY OF INTERESTED AND ACTIVE PARTIES CONCERNED WITH WATER RESOURCE MANAGEMENT IN WASHINGTON STATE: IMPLICATIONS FOR A MANAGEMENT SYSTEMS MODEL,
Washington State Univ., Pullman. Dept. of Political Science.
B. A. Haines.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 665, Price codes: A07 in paper copy, A01 in microfiche. Masters Thesis, 1978. 133 p, 3 fig, 17 tab, 24 ref, 9 append. OWRT A-090-WASH(2).

Descriptors: *Administration, *Management, *Washington, *Planning, *Water resources, Decision making, Water resources development, Water conservation, Water policy, Water utilization, State governments, Regional development, Human population, Systems analysis.

In response to a legislative mandate calling for public participation in water resource management in Washington State, a hypothetical management model was developed. The background of current policy decisions includes past and present statutory law, administrative regulations, and literature on the concept of beneficial use of water. Major factors considered in developing this model included: the present tax payer revolt seeking a reduction in government spending; increasing pressure for new uses/users of this resource which has finite, but unpredictable limits; and pressures from different users to establish theirs as the most important use. A management system utilizing non-governmental entities to develop and administer programs directed toward conservation, especially reducing waste, would address these problems. The management system is described and accompanied by a flow chart of its physical structure. To determine the potential usefulness of this model, data derived from questionnaire responses of governmental and non-governmental people interested and involved in water resources administration were used. The population study and its findings are reported. Conclusions relating to the validity of the model and further research recommendations are presented. (Davison-IPA)
W79-03693

AN ECONOMIC ANALYSIS OF PRICING RESIDENTIAL WATER SUPPLIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
R. Ramgolam, and H. Sahai.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 564, Price codes: A07 in paper copy, A01 in microfiche. Water Resources Research Institute, University of Puerto Rico, Completion Report December 1977. 122 p, 5 fig, 16 tab, 26 ref. OWRT A-047-PR(1).

Descriptors: *Water allocation(Policy), *Puerto, *Water rates, *Cost analysis, Discriminatory pricing, Water users, Water loss, Puerto Rico Aqueduct and Sewer Authority, Domestic water, Water policy.

A study of water pricing in Puerto Rico was conducted: (1) to examine the application of price theory in the allotment of residential water; (2) to determine which factors affect the price of water used in the residential areas; (3) to investigate and evaluate the existing price structure and pricing policy of residential water; and (4) examine water pricing policies based on economic criteria and provide recommendations for efficient water allocation to Puerto Rican residents. The Puerto Rico Aqueduct and Sewer Authority (PRASA) is a monopoly and a semi-autonomous agency of the Puerto Rican government which provides residential water service to all of Puerto Rico. Present rates are metered, based on a five block schedule applicable to all customer classes; the rates increase in the first two blocks and then decline. The rates were found discriminatory because of a higher charge to residential customers, with the highest charge to the middle class. A regression analysis indicated the following four variables significant in determining water rates: (1) number of customers served, (2) water loss, (3) net debt, and (4) government subsidies. It is recommended that charges for water service be equal to marginal production costs supplemented by a service charge equal to the difference between the average and marginal production costs. (Davison-IPA)
W79-03694

MOTORBOAT USE ON THE WILD ROGUE RIVER: AN INVESTIGATION OF USE BETWEEN WATSON CREEK AND BLOSSOM BAR,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 5B.

W79-03695

EVALUATION OF METHODOLOGY USED IN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN,
National Coastal Ecosystems Team, NSTL Station, MS.
R. H. Chabreck, J. B. Johnston, and J. B. Kirkwood.
In: Contributed Papers on Coastal Ecological Characterization Studies, Fourth Biennial International Estuarine Research Federation Conference October, 1977. U. S. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-77/37, p. 10-14, April, 1978. 3 tab.

Descriptors: *Evaluation, *Systems analysis, *Ecosystems, *Coasts, Coastal plains, Ecology, Land management, Simulation analysis, Design, Testing, Analysis.

The Chenier Plain, Texas-Louisiana, ecosystem characterization was the first investigation of this type to be initiated so that an important aspect of the project was an evaluation of the methodology used. This evaluation was needed also for the orderly execution of subsequent characterizations of other coastal ecosystems. A methodology evaluation made it possible to identify techniques which effectively served to meet project objectives, and at the same time it identified procedures that had not contributed significantly. Aspects of the characterization methodology evaluated include the steering committee concept, user needs survey, conceptual modeling, area delineation, type of mapping, data seach and presentations and pilot study. The results of the evaluations are given and the paper suggests alternative procedures where unsatisfactory results were obtained. (See also W79-03697) (Steiner-Mass)
W79-03700

MANAGEMENT OF SALINE WATER,
California Univ., Davis. Dept. of Agricultural Economics.
C. V. Moore, and J. H. Snyder.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 784, Price codes: A03 in paper copy, A01 in microfiche. Report No. 29, Water Resources Center, Univ of Calif, Davis, Mar 1974. 20 p, 6 fig. (California Water Resources Center Project UCAL-WRC-W-244). OWRT B-147-CAL(2), B-136-CAL(3), B-120-CAL(4), B-094-CAL(5).

Descriptors: *Economics, *Management, *Saline water, *Colorado River basin, *Salinity, Mexico, International waters, Withdrawal, *Irrigation efficiency, *California, *Imperial Valley(Calif), *Orange County(Calif), *Salton Sea(Calif).

Recent research on the economics of saline water management was surveyed and principal conclusions summarized. Salinity studies in the Colorado River Basin, Imperial Valley, Orange County (California), and Salton Sea were examined. Effects of agriculture on quantity and quality of water, methods of increasing irrigation efficiency, salinity in urban and recreational water uses, international and legal aspects of salinity, and cost-sharing in salinity control are discussed. Salinity in a river basin tends to increase from the headwaters to the mouth. The saline waters of the Colorado River pose major management problems in the regions studied, and are also important in relations with Mexico. Total water withdrawals exceed annual replenishments, and total dissolved salinity in the lower reaches of the river are near or beyond threshold uses. Estimated economic losses to domestic users are about $16 million and are projected to increase to a possible level of about $28 million by 1980.
W79-03774

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OUTLOOK FOR ENERGY AND IMPLICATIONS FOR IRRIGATED AGRICULTURE,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 3F.
W79-03667

ECONOMIC ANALYSIS OF CHLOROFORM REMOVAL FROM DRINKING WATER,
Maryland Univ., College Park. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 5F.
W79-03680

AN ECONOMIC ANALYSIS OF PRICING RESIDENTIAL WATER SUPPLIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 6B.
W79-03694

6D. Water Demand

'INSTREAM FOW'-APPLICABILITY OF EXISTING METHODOLOGIES FOR ALASKAN WATERS,
Woodward-Clyde Consultants, Anchorage, AL.
For primary bibliographic entry see Field 4A
W79-03517

METHODS FOR ESTIMATING AND PROJECTING WATER DEMANDS FOR WATER-RESOURCES PLANNING,
California Univ., Riverside.
E. M. Lofting, and H. C. Davis
In: Climate, Climatic Change, and Water Supply. Studies in Geophysics, National Academy of Sciences, Washington, D.C., p. 49-69, 1977. 11 fig, 14 tab, 70 ref.

Descriptors: *Water resources, *Long-term planning, *Water demand, *Forecasting, *Economic uncertainty, Estimating, Effects, Water utilization, Water requirements, Annual, Land use, Mathematical models, Systems analysis, Linear programming, Climatic variability, Water withdrawal.

Considered are the problems of estimating and forecasting water demands or requirements for the water-use categories of irrigation, commercial, municipal (residential), minerals industries, manufacturing industries, and thermoelectric power. Noted are three new sources of economic uncertainty which make forecasts of future water demand particularly problematic: (1) the enactment of Public Law 22-500; (2) a large increase in irrigated agriculture; and (3) the threat of climatic change. Water-resource systems planning and the role of water-use data in the development of water-use forecasts are discussed. Considered is the interregional linear programming model developed by Heady which yields the least-cost distribution of agricultural production by crop type and geographic region. Next the possible impacts of climatic variability are discussed. The paper concludes with a graphical comparison of existing water-use forecasts to the years 2000-2020, with the results of a simple forecasting model constructed by the authors. (See also W79-03527) (Bell-Cornell)
W79-03529

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-03537

6E. Water Law and Institutions

CALIFORNIA CHANGES ITS ENVIRONMENTAL QUALITY ACT,
California Resources Agency, Sacramento.
For primary bibliographic entry see Field 5G.
W79-03535

ENGINEERING SOLUTIONS TO BAY AREA DROUGHT CONDITIONS,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 4A.
W79-03536

A STUDY OF INTERESTED AND ACTIVE PARTIES CONCERNED WITH WATER RESOURCE MANAGEMENT IN WASHINGTON STATE: IMPLICATIONS FOR A MANAGEMENT SYSTEMS MODEL,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W79-03693

ENVIRONMENTAL QUALITY, THE MARKET, AND PUBLIC FINANCE,
Clemson Univ., S. C. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W79-03768

FEDERAL COMPLIANCE WITH STATE POLLUTION CONTROL REQUIREMENTS - CALIFORNIA V. ENVIRONMENTAL PROTECTION AGENCY, 511 F. 2D 963 (9TH CIR. 1975),
Wyoming Univ., Laramie. Coll. of Law
B J Trautwein
Land and Water Law Review, Vol. XI, No. 1, p. 147-157, 1976. OWRT-A-003-WYO(5), 14-31-0001-5051.

Descriptors: *Water law, Water pollution control, Water right, Federal Water Pollution Control Act, Jurisdiction.

This case note addresses the subject whether federal installations and agencies must comply with state substantive and procedural requirements with respect to water pollution. The court in deciding the case addressed the issues whether Congress waived exclusive jurisdiction over water pollution in a manner that was not unduly broad and whether the waiver was made in a clear and unequivocal manner. The court reached the decision that the 1972 Federal Water Pollution Control Act mandated federal compliance with state procedural requirements respecting water pollution control. The rationale for this result was that the 1972 Act gave the states the right to regulate water pollution by permit system and that federal compliance with the permit system was the only effective method insuring federal compliance with substantive state water pollution standards.
W79-03770

AN ECONOMIC METHODOLOGY FOR EVALUATING 'BEST MANAGEMENT PRACTICES' IN THE SAN JOAQUIN VALLEY OF CALIFORNIA,
Economics, Statistics, and Cooperatives Service, Washington, DC
For primary bibliographic entry see Field 5G.
W79-03958

6F. Nonstructural Alternatives

LAND USE ALLOCATION MODEL FOR FLOOD CONTROL,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies
For primary bibliographic entry see Field 4A
W79-03534

POLICIES FOR MINIMIZING FLOOD HAZARDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman.
Virginia Agricultural Economics No 260 p1-3, July 1974. OWRT-A-054-VA(1).

Descriptors: *Flood control, *Flood hazards, Water policy, *Flood damage, Floods, *Flood plain management.

A popularized discussion of the flood damage problem is presented. Included are definitions of flood hazard, identification of alternatives for flood hazard reduction, and consideration of issues in developing a policy toward flooding.
W79-03590

URBAN WATER RESOURCES POLICY ALTERNATIVES: A SOCIOLOGICAL ANALYSIS OF DIFFERENTIAL PERSPECTIVES,
Purdue Univ., Lafayette, IN. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W79-03660

NWS'S FLASH FLOOD WARNING AND DISASTER PREPAREDNESS PROGRAMS,
National Weather Service, Silver Spring, MD. Disaster Preparedness Staff.
H. M. Mogil, J. C. Monro, and H. S. Groper.
Bulletin of the American Meteorological Society, Vol 59, No 6, p 690-699, June 1978. 8 fig, 53 ref.

Descriptors: *Flash floods, *Warning systems, *Forecasting, *Planning, Disasters, Floods, Excessive precipitation, Precipitation(Atmospheric), Rainfall, Thunderstorms, Tropical storms, Hazards, Flood plains, Radar, Communication, Weather, Meteorology.

Flash floods have become the nation's number one stormy weather killer in the 1970s. Deaths from flash floods are now approaching 200 each year compared to an average of less than 70 per year during the preceding 30-year period. Losses from flash floods are now nearly 10 times what they were in the 1940s. To combat these escalating losses, the National Weather Service (NWS) is expanding its efforts to improve forecasting and warning of flash floods and to improve the public's response to flash flood threats. This paper summarized the present and planned NWS operational flash flood warning and disaster preparedness programs. (Sims-ISWS)
W79-03816

6G. Ecologic Impact Of Water Development

INSTREAM FOW'-APPLICABILITY OF EXISTING METHODOLOGIES FOR ALASKAN WATERS,
Woodward-Clyde Consultants, Anchorage, AL.
For primary bibliographic entry see Field 4A.
W79-03517

ENVIRONMENTAL SPECIALISTS IN WATER AGENCIES,
Stanford Univ., CA. Dept. of Civil Engineering.
J. R. Jenkins, and L. Ortolano.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. WR1, p. 61-74, November 1978. 1 fig, 1 tab.

Descriptors: *Water resources, *Management, *Government agencies, *Personnel, *Environmental impact statements, Civil engineers, Organization theory, Reports, Water plans.

There are five different roles that environmental specialists can play in water resource agencies: (1) environmental planning; (2) environmental design; (3) system monitoring; (4) report preparation; and (5) report review. Placement of environmental specialists in 'line units' (e.g., planning, design, and maintenance) facilitates coordination. There are, however, significant advantages, in terms of report preparation and review, of keeping environmental specialists in one organization unit and not diffusing them into various units. But with a separate 'staff unit' for environmental specialists, these specialists haveless influence on planning and decision making. Numerous aspects of this dilema are explored using data for the Santa Clara Valley Water District in California and several District Offices of the U.S. Army Corps of Engineers. In the final analysis, the organization arrangement that is in some sense best depends on which of the several roles played by the environmental specialists is to receive emphasis. (Bell-Cornell)
W79-03531

CALIFORNIA CHANGES ITS ENVIRONMENTAL QUALITY ACT,
California Resources Agency, Sacramento.
For primary bibliographic entry see Field 5G.
W79-03535

PUBLIC PROCESS PORTION OF IMPACTS ANALYSIS,
Parsons, Brinckerhoff, Quade and Douglas, Inc., Vienna, VA.
F. W. Montanari.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 104, No WR1, p 123-128, November 1978. 2 fig.

Descriptors: *Water resources, *Management, *Social participation, *Environmental impact statements, Water plans, Projects, NEPA, Public process, Anatomy of delay.

With over 8 years of experience with NEPA and public participation in environmental analysis, there is a need to evaluate the cost of the process as compared with the benefits achieved in the actual projects. Frequently, opponents to the actions have sought only to destroy the projects, not to contribute to providing needed services to society. The implications of the public portion of the environmental planning and management with and without public participation are described. An anatomy of delay cites an actual case history of extreme frustration and costly delay in clearing a needed, well-planned, and environmentally-sound project. A post audit to evaluate the results of the process to make NEPA operate efficiently is recommended. (Bell-Cornell)
W79-03539

THE CIVIL ENGINEER'S RESPONSIBILITY IN IMPACT ANALYSIS.
American Society of Civil Engineers, New York. Committee on Impact Analysis of the Water Resources Planning.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers. Vol 104, No WR1, p 253-263, November 1978. 6 ref, 8 append.

Descriptors: *Environmental effects, *Water resources, *Environmental factors, *Environmental impact statements, Natural resources, Planning.

Ways are suggested for engineers and others to make environmental impact analysis more effective by giving specific consideration to the following points: incoporating the analysis as an integral part of the total planning process; recognizing risks in the analysis and decisions; focusing on important issues; recognizing and accounting for the reliability of information; pursuing levels of detail in the analysis consistent with levels in other parts of the planning process and with the importance of the respective issues; making costs of the analysis consistent with other planning costs; and expressing criteria for selection of professional experts and for dealing with nonexpert opinion (insofar as possible eliminating inconsistency of evaluation procedures among various water programs, with the engineer assuming an appropriate role in the public arena, combining EIS with other required environmental documents, and taking adequate time for the analysis.) (Bell-Cornell)
W79-03541

AQUATIC AND TERRESTRIAL SURVEYS IN THE VICINITY OF POWER PLANTS USING REMOTE SENSING,
Calspan Corp. Buffalo, NY.
For primary bibliographic entry see Field 5A.
W79-03567

CONTRIBUTED PAPERS ON COASTAL ECOLOGICAL CHARACTERIZATION STUDIES. FOURTH BIENNIAL INTERNATIONAL ESTUARINE RESEARCH FEDERATION CONFERENCE, OCTOBER, 1977.
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
For primary bibliographic entry see Field 2L.
W79-03697

COASTAL ECOLOGICAL CHARACTERIZATION-AN OVERVIEW,
National Coastal Ecosystems Team, NSTL Station, MS.
For primary bibliographic entry see Field 2L.
W79-03698

USER-ORIENTED CONCEPTUAL MODELING IN THE ECOLOGICAL CHARACTERIZATION OF THE SEA ISLANDS AND COASTAL PLAIN OF SOUTH CAROLINA AND GEORGIA,
South Carolina Wildlife and Marine Resources Dept., Charleston. Marine Resources Research Inst.
For primary bibliographic entry see Field 6A.
W79-03701

IMPORTANCE OF RIPARIAN ECOSYSTEMS: BIOTIC CONSIDERATIONS,
New Mexico Dept. of Game and Fish, Santa Fe.
For primary bibliographic entry see Field 2I.
W79-03706

IMPORTANCE OF RIPARIAN ECOSYSTEMS: ECONOMIC CONSIDERATIONS,
Arizona Water Commission, Phoenix.
K. Fox.
In: Importance, Preservation and Management of Riparian Habitat; A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43 p. 19-22.

Descriptors: *Riparian land, *Economics, *Vegetation, Forests, Recreation, Agriculture, Flood control, Water yield improvement, Effects, Wetlands, Habitats.

Most clearing of the riparian zone today consists of clearing phreatophytes along the Colorado River below the Davis Dam. Such land is cleared for agricultural purposes, the development of subdivisions, and water yield improvement and flood damage reduction projects. Recreational use is also a threat to riparian habitats. (Stihler-Mass)
W79-03707

A RIPARIAN CASE HISTORY; THE COLORADO RIVER,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
R. D. Ohmart, W. O. Deason, and C. Burke
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p 35-47 1 fig, 38 ref

Descriptors: *Riparian land, *Riparian plants, *Cottonwoods, *Colorado River, Southwest U.S., Trees, Vegetation, Birds, Habitats, Dams, Agriculture, Wetlands, Rivers

Historically to present cottonwood communities have declined in abundance along the lower Colo-

rado River to the condition that the future of this natural resource is precarious. Avian species showing strong specialization to cottonwood communities may be extirpated should the cottonwood community be lost from the river. Only through the concern and action by responsible can we assure the persistance of this natural resource. (Stihler-Mass)
W79-03709

WILDLIFE CONFLICTS IN RIPARIAN MANAGEMENT: GRAZING,
Coronado National Forest, Tuscon, AZ.
For primary bibliographic entry see Field 4C.
W79-03710

WILDLIFE CONFLICTS IN RIPARIAN MANAGEMENT: WATER,
Forest Service, Albuquerque, NM.
C. E. Kennedy.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 52-58. 4 fig, 33 ref.

Descriptors: *Riparian land, *Grazing, *Trees, Effects, Livestock, Southwest U.S., Arizona, New Mexico, Wetlands.

Many streams in Arizona and New Mexico are dependent upon the riparian zone and their associated wetlands for their primary energy source. Continued grazing has eliminated riparian trees in many areas. When this occurs, streams are less confined to their banks and have a more constant sediment load. Fencing out livestock may reduce such damage. (Stihler-Mass)
W79-03711

MANAGEMENT ALTERNATIVES FOR RIPARIAN HABITAT IN THE SOUTHWEST,
Apache-Sitgreaves National Forest, Springerville, AZ.
G. A. Davis.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 59-67. 19 ref.

Descriptors: *Riparian land, *Riparian plants, *Management, *Southwest U.S., Ecology, Grazing, Livestock, Evaluation, Trees, Vegetation, Streams, Wetlands.

Riparian habitats may fail to regenerate themselves because of: loss of water flow as a result of diversion, loss of significant portions of entire communities due to floods, high recrational use, phreatophyte control projects, or overgrazing by livestock. A 100-point transect technique for riparian stand analysis is described. Stand composition, crown density, basal area, vigor, and stand structure are taken into account. Management alternatives and objectives are evaluated for environmental consequences. (Stihler-Mass)
W79-03712

ENDANGERED SPECIES VS. ENDANGERED HABITATS: A CONCEPT,
Grand Canyon National Park, AZ.
R. R. Johnson, L. T. Haight, and J. M. Simpson.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 68-79. 3 tab, 81 ref.

Descriptors: *Riparian land, *Habitats, *Birds, Wetlands, Streams, Dams, Legal aspects, Wildlife, Management, Southwest U.S., Endangered species.

The highest densities of nesting birds in North America have been reported from Southwest riparian forests. Complete loss of riverine habitat in the Southwest lowlands could result in extirpation of 47 percent of the 166 species of birds which nest in this region. (Stihler-Mass)
W79-03713

RIPARIAN RESEARCH NEEDS,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ.
D. R. Patton.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tucson, Arizona, USDA Forest Service General Technical Report RM-43, p. 80-82. 2 fig, 3 ref.

Descriptors: *Riparian land, *Research priorities, *Southwest U.S., Wetlands, Vegetation, Trees, Wildlife, Ecology, Maps, Classification, Riparian plants, Management.

Approximately 22 studies on riparian are in progress in the western United States. Six categories of studies are needed to provide managers with data for making decision. These are: inventories and maps, vegetation classification, plant-animal associations, influence of man and nature, silvics of tree species and life history of vertebrate speicies. The concept of 'validation sites' can be used in a team approach to solve plant and animal problems. (Stihler-Mass)
W79-03714

AN OVERVIEW OF RIPARIAN FORESTS IN CALIFORNIA: THEIR ECOLOGY AND CONSERVATION,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 2I.
W79-03716

REGENERATION AND DISTRIBUTION OF SYCAMORE AND COTTONWOOD TREES ALONG SONOITA CREEK, SANTA CRUZ COUNTY, ARIZONA,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W79-03717

ECOLOGICAL STUDY OF SOUTHWESTERN RIPARIAN HABITATS: TECHNIQUES AND DATA AVAILABILITY,
Arizona State Univ., Tempe. Dept. of Zoology; and Arizona State Univ., Tempe. Center for Environmental Studies.
B. W. Anderson, R. W. Engel-Wilson, D. Wells, and R. D. Ohmart.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 146-155. 6 fig, 1 tab, 8 ref.

Descriptors: *Wildlife, *Vegetation, *Riparian land, *Colorado River, Ecology, Ecological distribution, Riparian plants, Mammals, Rodents, Birds, Census, Density, Vegetation, Habitats, Litter, Southwest U.S., Wetlands.

Data were gathered to examine faunal community relationships to various plant community types and to gain detailed knowledge of an individual species' vegetational preference and its niche within the riparian habitat along the lower Colorado River. Examination of parameters such as habitat breadth, habitat and niche overlap and dispersal is instructive in the determination of a species' niche. (Stihler-Mass)
W79-03721

THE IMPORTANCE OF RIPARIAN HABITAT TO MIGRATING BIRDS,
Museum of Northern Arizona, Inc., Flagstaff
For primary bibliographic entry see Field 2I.
W79-03722

SOME EFFECTS OF A CAMPGROUND ON BREEDING BIRDS IN ARIZONA,
Museum of Northern Arizona, Inc., Flagstaff
For primary bibliographic entry see Field 4C.
W79-03724

SOUTHWESTERN RIPARIAN COMMUNITIES: THEIR BIOTIC IMPORTANCE AND MANAGEMENT IN ARIZONA,
Arizona Game and Fish Dept., Phoenix.
D. E. Brown, C. H. Lowe, and J. F. Hausler.
In: Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977, Tuscon, Arizona, USDA Forest Service General Technical Report RM-43, p. 201-211. 11 fig, 56 ref.

Descriptors: *Riparian land, *Southwest U.S., *Management, *Ecology, Riparian plants, Vegetation, Forests, Trees, Cottonwoods, Mesquit, Wildlife, Livestock, Grazing, Ecology, Hydrology, Watershed management, Classificatio, Marshes, Wetlands, Streams, *Arizona.

The distribution, ecology, vegetation and hydrology of riparian communities occurring in t southwestern United States are discussed briefl Recommendations are made concerning the ma agement of streamside environments and their w tersheds. These include recommendations perta ing to the classification and inventory of ripari habitats; the determination of limiting factors f key riparian species; the establishment of stu areas; the regulation and elimination of livesto grazing; the greater consideration of streamsi vegetation in authorizing water management pr jects; and the more conservative use of our wat sheds. (Stihler-Mass)
W79-03727

TERRESTRIAL MAMMALS OF THE RIPARIAN CORRIDOR IN BIG BEND NATIONAL PARK,
Texas A and M Univ., College Station Dept. Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 2I.
W79-03728

IMPORTANCE, PRESERVATION, AND MANAGEMENT OF RIPARIAN HABITAT: A OVERVIEW,
Museum of Northern Arizona, Inc., Flagst Dept. of Biology.
S. W. Carothers.
In: Importance, Preservation and Management Riparian Habitat: A Symposium, July 9, 19 Tucson, Arizona, USDA Forest Service Gene Technical Report RM-43, p. 2-4. 9 ref.

Descriptors: *Riparian land, *Riparian plants, * izona, Southwest U.S., Rooted aquatic pla Birds, Wildlife, Agriculture, Flood control, W lands.

The imminent demise of the riparian woodland be linked to the land utilization practices of m Settlers cleared large expanses of natural veg tion as a source of building materials and so the alluvial bottom soils could be put into agri tural production. As recently as the 1960's, belt riparian woodland were being removed by w salvage and flood control agencies. Destructio riparian vegetation has adverse effects on wild in these vegetation zones and in surrounding h tats. (Stihler-Mass)
W79-03729

AN ANALYSIS OF LAKE LEVEL INFLUEN ON VEGETATION IN LAKE CHAMPLAIN,
Aquatec, Inc., South Burlington, VT.
For primary bibliographic entry see Field 2H.
W79-03745

SUMMARY OF AVAILABLE INFORMATI ON CHESAPEAKE BAY SUBMERGED VE TATION,
Maryland Univ., Cambridge. Horn Point Envi mental Lab.
For primary bibliographic entry see Field 2I.
W79-03746

ANNUAL METABOLISM OF A TEMPORA POND ECOSYSTEM,
Cornell Univ., Ithaca, NY. Section of Ecology

Systematics
For primary bibliographic entry see Field 2I.
W79-03750

THE EFFECTS OF DITCHING A SALT MARSH ON COLONY AND NEST SITE SELECTION BY HERRING GULLS (LARUS ARGENTATUS),
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
J. Burger, and J. Shisler.
The American Midland Naturalist, Vol. 100, No. 1, p. 54-63, July, 1978. 1 fig, 4 tab, 49 ref.

Descriptors: *Salt marshes, *Ditches, *Gulls, *Nesting, *Effects, Nesting cover, Wildlife, Birds, Wetlands, Ecology, Ecological distribution, Life history studies, Habitat, New Jersey.

One-half of Sandy Island, New Jersey, which was ditched with internal ditches connected to the surrounding bay, underwent a major vegetation change as bushes replaced the naturally occurring Spartina over 80 percent of the area. No significant vegetational hanged occurred on the half of the island with only internal ditching, and the population of herring gulls moved to this area. Gulls nested in Spartina patens on spoil piles near bushes. As the highest in the marsh, these areas are less susceptible to storm and flood tides. The gulls nesting on spoils built higher nests, laid bigger eggs, and had a higher mean clutch size than birds that did not nest on spoil piles. Spoil piles are suggested as the preferred habitat of the older, more experienced birds. (Howard-Mass)
W79-03752

ENVIRONMENTALIZING AGRICULTURAL PRODUCTION CONTROL POLICIES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W79-03767

ENVIRONMENTAL QUALITY, THE MARKET, AND PUBLIC FINANCE,
Clemson Univ., S. C. Water Resources Research Inst.
H. H. Macaulay.
In: Modern Fiscal Issues. Richard M. Bird and John G. Head, eds., University of Toronto Press, Toronto, Canada, p. 187-224, January 1973. 4 fig, 39 ref. OWRT B-030-SC(7).

Descriptors: Compensation, *Cost allocation, *Economic efficiency, *Equilibrium prices, *Government finance, *Payment, *Pollution taxes(Charges), *Competitive use, Subsidies, Regulations.

Earlier writings by Pigou, Knight, and Coase are examined to show that the problems of pollution may be analyzed more accurately if they are viewed as resulting from conflicting desires to use some presently unpriced asset. Thus, firms want to use water quality for waste disposal, while fishermen want to use it for propagation of fish. In this respect the environment is more nearly like a private good than a public good. A graphical analysis of the value placed on the environment by competing users, both public and private, is presented. Regulations, subsidies, and charges are discussed as means for attaining the optimum use of the environment. They are analyzed separately, and charges are recommended as most likely to produce an economic optimum. However, charges should be bilateral, i.e., levied on both those who wish to discharge wastes and those who wish to limit waste discharge. The government is a logical party to assume ownership where none previously clearly existed and to collect revenues for use of the environment. Funds collected should be assigned to general revenues and not necessarily used for pollution abatement unless the use provides the highest marginal return of all possible government expenditures.
W79-03768

EFFECTS OF OIL ON AQUATIC BIRDS,
Fish and Wildlife Service, Laurel MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5C.
W79-03837

RESTORATION OF OIL-CONTAMINATED SHORELINES,
URS Co., San Mateo, CA.
For primary bibliographic entry see Field 5G.
W79-03840

OHIO RIVER BASIN ENERGY STUDY, ORBES PHASE I: INTERIM FINDINGS,
Illinois Univ., Urbana-Champaign.
J. J. Stukel, and B. R. Keenan.
Interim Report No. EPA-600/7-77-120, November 1977. 170 p, 9 fig, 32 tab, 43 ref, 10 append. R804848-01.

Descriptors: *Energy, *Public utilities, *Ohio River Basin, Interstate, Environmental effects, Social aspects, Social participation, Social impact, Public health, Planning, Biology, Economics, Nuclear energy, Fossil fuels, Power plants, Regional analysis, Investigations, Water supply.

An assessment of the potential environmental, social, and economic impacts of proposed powerplants and other energy conversion facilities on a large section of the Ohio River Basin is summarized. The Ohio River Basin Energy Study (ORBES) Phase I was conducted by faculty from six state universities within the study region: all of Kentucky, large parts of Illinois, Indiana, and Ohio. The two basic options, high energy-growth and low energy-growth, were analyzed, and two scenarios were created for each with varying mixes of coal-fired and nuclear-fueled energy conversion facilities. Preliminary findings of Phase I are regional and include information on natural resources, developed resources, the ecological and biological environment, public health, and economic and social factors. Major findings include: (1) air quality limitations in the region are becoming increasingly important considerations; (2) water availability limitations may become important before the year 2000; and (3) a high rate of growth may be associated with an insufficient supply of skilled labor for the construction of conversion facilities. (Davison-IPA)
W79-03971

ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING, PART I: FISHES OF PICEANCE CREEK, COLORADO, PRIOR TO OIL SHALE PROCESSING,
Colorado Div. of Wildlife, Fort Collins. Fisheries Research Center.
For primary bibliographic entry see Field 5C.
W79-03974

ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING, PART II: THE AQUATIC MACROINVERTEBRATES OF THE PICEANCE BASIN, COLORADO, PRIOR TO OIL SHALE PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-03975

7. RESOURCES DATA

7A. Network Design

EVALUATING THE SAMPLING FREQUENCIES OF WATER QUALITY MONITORING NETWORKS,
Colorado State Univ., Fort Collins. Dept. of Agriculture and Chemical Engineering
For primary bibliographic entry see Field 5C.
W79-03976

7B. Data Acquisition

INFORMATION REQUIREMENTS FOR IMPROVING HYDROPOWER,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 8C.
W79-03542

MEASURING SYMBIOTIC NITROGEN FIXATION IN RANGELAND PLOTS OF TRIFOLIUM SUBTERRANEUM L. AND BROMUS MOLLIS L.,
California Univ., Davis. Dept. of Agronomy and Range Science; and California Univ., Davis. Dept of Vegetable Crops.
D. A. Phillips, and J. P. Bennett.
Agronomy Journal, Vol. 70, No. 4, p 671-674, July-August, 1978. 3 fig, 1 tab, 16 ref.

Descriptors: *Nitrogen fixation, *Range grasses, Legumes, Clovers, *Range management, Symbiosis, Isotop studies.

The 15N A-value technique and the acetylene reduction method were compared for their accuracy in determining seasonal symbiotic N2 fixation on a ground area basis in rangeland plots of Trifolium subterraneum L. and Bromus mollis L. To simulate range management practices, seeds were planted at 10, 141, or 1970 seeds/sq m in pure stands or 50:50 mixtures in Laughlin loam, a member of the fine-loamy, mixed, mesic family of Ultic Haploxerolls. Amounts of N2 fixed, calculated by the 15N A-value technique, varied significantly with planting density and proportion of clover at different densities. Seasonal, symbiotic N2 fixation, calculated from the acetylene reduction method, did not vary significantly with either planting density or proportion of clover. It is concluded that with appropriate studies on possible differences in isotope accumulation by a grass and a legume, including morphological, physiological, and bio-chemical differences, the 15N A-value technique should be more quantitative and discriminatory than the acetylene reduction technique. The single seasonal sampling requirement of the 15N A-value technique also is more amenable to the overall goal of determining the effect of range management systems on symbiotic N2 fixation. (Skogerboe-Colorado State)
W79-03552

AQUATIC AND TERRESTRIAL SURVEYS IN THE VICINITY OF POWER PLANTS USING REMOTE SENSING,
Calspan Corp. Buffalo, NY.
For primary bibliographic entry see Field 5A.
W79-03567

SEMI-INFINITE SOLID MODEL FOR PREDICTION OF TEMPERATURE IN DEEP RESERVOIRS AND LAKES,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2H.
W79-03581

PHYSICAL METHODS OF STUDYING ICE AND SNOW,
Army Terrestrial Science Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W79-03596

RADIOPHYSICAL METHODS FOR ANALYZING ICE AND SNOW,
For primary bibliographic entry see Field 2C.
W79-03597

FM RADAR SIGNALS REFLECTED FROM ICE SURFACES, AND THE POSSIBILITIES FOR MODELING THEM,
For primary bibliographic entry see Field 2C.
W79-03598

EFFECT OF ICE STRUCTURE ON ITS RADIATION CHARACTERISTICS IN THE SHF RANGE,
For primary bibliographic entry see Field 2C.
W79-03599

PROPAGATION OF RADIO WAVES IN GLACIERS,
For primary bibliographic entry see Field 2C.
W79-03600

RADIO SOUNDING OF SEA ICE,
For primary bibliographic entry see Field 2C.
W79-03601

EMISSIVITY O ICE, TERRESTRIAL, AND SEA SURFACES MODELED BY STRATIFIED HETEROGENEOUS STRUCTURES,
For primary bibliographic entry see Field 2C.
W79-03602

MEASUREMENT OF REFLECTED SIGNALS DURING RADAR SOUNDING IN A LARGE RANGE OF ANGLES,
For primary bibliographic entry see Field 2C.
W79-03603

DEPOLARIZATION OF REFLECTED RADIO SIGNALS,
Z. Klau Dzh
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 42-47, August 1976. 1 fig, 6 ref.

Descriptors: *Radio waves, *Ice, *Ice cover, Remote sensing, Radar, Measurement, Snow, Reflectance, Microwaves, Anisotropy, On-site investigations, Depolarization, Reflected signals, Ice shelf.

Elliptical and linear depolarization of reflected radio signals propagating in a glacier were examined. Elliptical depolarization is usually the result of propagation in an anisotropic medium. Linear depolarization occurs with reflection from a rough surface. Depolarization observed at Skelton glacier in 1966 can be ascribed to both mechanisms. Signals coming from great depths (10 microseconds) depolarize as a result of internal reflections at the South Pole, while signals coming from lesser depths (5 microseconds) are not depolarized. (See also W79-03596) (Sims-ISWS)
W79-03604

REMOTE MEASUREMENT OF THE THICKNESS OF SEA ICE BY RADAR METHODS,
M. I. Finkel'shteyn, V. A. Kutev, V. G. Glushnev, and E. I. Lazarev.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 48-51, August 1976. 1 fig, 1 tab, 10 ref.

Descriptors: *Remote sensing, *Sea ice, *Radar, Measurement, Ice, Sounding, Radio waves, Microwaves, Salinity, Electronics, Electromagnetic waves, Ice thickness.

This article examined the simple radio pulse method, the shock antenna excitation method, and the video pulse method with a correction. The cited experimental data confirmed that use of the last method permits measurement of the thickness of highly saline sea ice beginning with 50-60 cm. At an ambient air temperature below -22C, the mean velocity of radio waves in ice is 130 m/microsecond. (See also W79-03596) (Sims-ISWS)
W79-03605

INSTRUMENTS FOR ANALYZING SPECTRAL REFLECTION OF LIQUID WATER IN THE WAVELENGTH RANGE FROM 1 TO 50 MICRONS,
Vsesoyuznyi Elektrotekhnicheskii Inst., Moscow (USSR). Dept. of the Fundamentals of Electronic Engineering.
M. A. Kropotkin.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 73-78, August 1976. 2 fig, 9 ref.

Descriptors: *Optical properties, *Water, *Laboratory tests, *Reflectance, Instrumentation, Equipment, Physical properties, Water properties, Spectrometers, Radiation, Infrared radiation, Reflection factor.

An attachment to a standard single-beam infrared spectrometer used to measure spectral reflection factors in the wavelength range from 1 to 20 microns, and a special device to measure reflections in the wavelength zone from 20 to 50 microns were described. The latter consists of a single-beam infrared spectrometer with exchangeable diffraction grids and an optical system which to focus radiation either onto a sample or onto a receiver, located beneath a reflecting hemisphere. A convergent beam with an apex angle of 5 deg fell on the water surface under analysis for all measurements. It was demonstrated that when the reflecting hemisphere in the described apparatus is replaced by a reflecting hemiellipsoid, it can be used to analyze the infrared reflection spectrum of snow and ice. (See also W79-03596) (Sims-ISWS)
W79-03610

THE PROBLEM OF STUDYING CHARGE GENERATION ON THE PHASE INTERFACE OF 0.001 MOLAR SODIUM CHLORIDE SOLUTION UNDERGOING DIRECTED FREEZING,
For primary bibliographic entry see Field 2C.
W79-03611

LOW FREQUENCY POLARIZATION OF ICE IN FROZEN COARSE-DISPERSION FORMATIONS,
For primary bibliographic entry see Field 2C.
W79-03614

COASTAL ICE DYNAMICS ACCORDING TO SLAR OBSERVATIONS,
S. M. Losev, and Yu. A. Gorbunov
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 102-111, August 1976. 3 fig, 4 tab, 7 ref.

Descriptors: *Remote sensing, *Sea ice, *Radar, *Coasts, Aircraft, Drifting(Aquatic), Islands, Ice cover, Movement, Photography, Aerial photography, Side-looking airborne radar, Ice dynamics, Ice compression, Ice compactness, Drift velocity.

Specific features of the dynamics of ice on polar seas were analyzed on the basis of observations by a side-looking airborne radar set with an observation interval of 2 days. It was established that the effect of islands on movement of compacted ice on the drift side extends for a distance equal to 5 cross sections of the island with respect to the normal to the drift. The zone of influence is half as great on the opposite side. Data indicating a significant difference in the influence of the shore on change in the normal and tangent components of the drift velocity vector as the distance from land increases were presented. Relative deformation of the area of an ice cover surface element was used to study ice compression and rarefaction. On the whole, the research results indicated the great possibilities for using side-looking radar to study the kinematics and dynamics of ice cover in greater depth. (See also W79-03596)(Sims-ISWS)
W79-03615

SEA SURFACE TEMPERATURE OBSERVATIONS BY A RADIATION THERMOMETER ABOARD AN ICE RECONNAISSANCE AIRCRAFT,
A. I. Paramonov, Yu. A. Gorbunov, and S. M Losev
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 112-118, August 1976. 2 fig, 2 tab, 2 ref.

Descriptors: *Remote sensing, *Temperature, *Oceans, *Sea ice, *Arctic, Aircraft, Equipment, Electronic equipment, Surveys, Water temperature, Infrared radiation, Ice, Ice cover, Oceanography, Sea surface temperature, Radiation thermometers.

The results of an inspection of the precision by which a PRT-5 radiation thermometer can measure the temperature of the sea surface, performed in August-September 1973 in the eastern Arctic, were presented. The observation materials confirmed the possibility of using this radiometer during airborne ice reconnaissance to measure water temperature on the sea surface, not only in the presence of ice but also in areas of open water between ice blocks of different degrees of compactness. Also, it was demonstrated that during the time of freezing, the temperature of ice of different ages differs significantly. (See also W79-03596)(Sims-ISWS)
W79-03616

USE OF ACOUSTIC METHODS TO ANALYZE SNOW AND ICE,
V. P. Gavrilo, and A. V. Gusev.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 119-125, August 1976. 2 fig, 6 ref.

Descriptors: *Remote sensing, *Acoustics, *Snow, *Ice, Physical properties, Mechanical properties, Temperature, Density, Salinity, Pressure, Sound waves, Ice-water interfaces, Elasticity(Mechanical), Viscosity, Laboratory tests, On-site investigations.

Grounds were given for the extensive possibilities of acoustic methods to study physical characteristics of freshwater, sea, and glacier ice and snow cover. Pulsed ultrasonic and resonant methods permitted a broad complex of measurements to determine the elastic characteristics of various types of ice and snow (for example Young's modulus, the shear modulus, the Poisson ratio, the viscosity coefficient, and attenuation and scattering of ultrasonic oscillations in ice depending on temperature, density, salinity, and static pressure). These measurements can be used to predict the mechanical properties of ice cover if data on its temperature and salinity are available. The applied significance of such research was demonstrated. (See also W79-03596)(Sims-ISWS)
W79-03617

ATTENUATION AND SCATTERING OF SOUND WAVES BY SEA ICE,
V. V. Bogorodskiy, G. Ye. Smirnov, and S. A. Smirnov
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 126-132, August 1976. 2 fig, 4 ref.

Descriptors: *Attenuation, *Absorption, *Sound waves, *Sea ice, Sonar, Remote sensing, Laboratory tests, On-site investigations, Ice, Oceans, Temperature, Crystals, Ultrasonics, Measurement, Theoretical analysis, Ice thickness.

Theoretical and experimental research on absorption and scattering of ultrasonic waves by sea ice structure was presented in this work. Explanation of the observed effects were given, and it was demonstrated that sea ice has different acoustic contrasts, which can be used to visualize the low ice surface. (See also W79-03596)(Sims-ISWS)
W79-03618

ONE METHOD FOR MEASURING SOUND ATTENUATION IN NATURAL ICE,
N. A. Grubnik, and O. V. Kudryavtsev
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research a

Engineering Laboratory, Hanover, New Hampshire, p 133-134, August 1976. 2 ref.

Descriptors: *Attenuation, *Sound waves, *Ice cover, Ice, Properties, On-site investigations, Measurement, Sea ice, Glaciers, Lake ice, Correlation analysis.

A method was described for direct measurement of attenuation of sound waves in natural ice based on using a complex wideband acoustic signal followed by its optimum processing. Attenuation coefficients were determined on the basis of the degree to which correlation maximums (observed upon matching of the instantaneous frequencies of the reference and directly received signals) decline, depending on range. (See also W79-03596)(Sims-ISWS)
W79-03619

SEISMIC AND TILT METER METHODS FOR ANALYZING ICE COVER,
V. N. Smirnov, and Ye. M. Lin'kov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 135-139, August 1976. 1 fig, 1 tab, 4 ref.

Descriptors: *Seismic studies, *Ice cover, *Seismic waves, Ice, Sea ice, Lake ice, Loads(Forces), Stress, Elasticity(Mechanical), Deformation, Gravity waves, Mechanical properties, Physical properties, Ice breakup, Flexural-gravitational waves.

Two examples of ice cover analysis employing seismic methods were examined. The moduli of elasticity of ice cover determined by means of sag in response to a load and a dynamic method were compared. It was revealed from observations at the Severnyy Polyus-20 station that triggering stresses causing ice breakup arise when trains of flexural-gravitational waves appear suddenly in ice. (See also W79-03596)(Sims-ISWS)
W79-03620

ANALYSIS OF GLACIER DYNAMICS USING A LASER DEFORMOGRAPH,
For primary bibliographic entry see Field 2C.
W79-03621

A METHOD FOR MEASURING HIGH MOISTURE RESERVES IN SNOW COVER USING COSMIC RADIATION,
S. I. Avdyushin, Yu. F. Barabanshchikov, R. M. Kogan, Yu. M. Kulagin, and I. M. Nazarov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 169-173, August 1976. 1 fig, 7 ref.

Descriptors: *Snow cover, *Moisture content, *Remote sensing, Radiation, Measurement, Instrumentation, Equipment, Mountains, Snowpacks, Snow surveys, Water resources, Snow, Cosmic radiation.

A system for measuring moisture reserves in montane snow was examined. The system is based on taking account of attenuation of galactic cosmic radiation by snow. The applicability of this system to measurement of moisture reserves at thicknesses from several hundred to several thousand millimeters was demonstrated. The apparatus was described, and the results of a long-term experiment at the high-altitude Kharam-Kul' Station of the Tadzhik SSR Administration of Hydrometeorological Service to determine water reserves in snow by means of recording galactic cosmic particles were presented. It was demonstrated that when the moisture reserves are from 10 to 900 mm, the precision with which they can be measured is 34 mm. It was noted that the greater part of error stems from daily variations in galactic cosmic radiation. A way to reduce this error was shown. (See also W79-03596)(Sims-ISWS)
W79-03626

A RADIO HYDROACOUSTIC METHOD FOR ANALYZING MODERATE-RANGE CHARACTERISTICS OF SEA ICE DYNAMICS,
V. V. Bogorodskiy, V. P. Gavrilo, and A. P. Polyakov.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 220-229, August 1976. 3 fig, 1 tab, 11 ref.

Descriptors: *Sea ice, *Movement, *Remote sensing, Radio, Acoustics, Model studies, Mathematical models, On-site investigations, Aerial photography, Ice, Cold regions, Arctic, Measurement, Equipment, Instrumentation, Ice movement, Ice breakup.

The basic physical premises of the radio hydroacoustic method for analyzing sea ice dynamics were developed. An experimental assessment was given of the precision of the method under the conditions of drifting ice on the Arctic Ocean, which assumes a value on the order of 0.01-0.03% of the measured range (about 20-30 km), not taking account of the effect of medium variability during the time of measurement. Models of drifting automatic radio hydroacoustic statons, which were used to make the first measurement of moderate-range characteristics of sea ice dynamics, were manufactured and tested. (See also W79-03596)(Sims-ISWS)
W79-03633

THE LANDSAT LAKE EUTROPHICATION STUDY,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
K. W. Holmquist.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 678, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, 1977. 94 p, 11 fig, 6 tab, 12 ref, 6 append. OWRT A-062-WIS(2), 14-34-0001-5050, 14-34-0001-6052.

Descriptors: *Lakes, *Eutrophication, *Computer programs, *Remote sensing, Time series analysis, *Classification, Computer programs, Trophic levels, *ERTS, *LANDSAT imagery, *Wisconsin.

A cooperative program between the Wisconsin Department of Natural Resources and the University of Wisconsin has resulted in an initial assessment of the trophic status of inland lakes in the State of Wisconsin from LANDSAT data. The feasibility of using both the photographic representation of the LANDSAT imagery as well as the digital representation of the LANDSAT imagery to classify lakes was investigated. It was determined that LANDSAT imagery can be used to predict lake water parameters or trophic classification. Time series data analyses indicated the necessity of a periodic rather than a one-time data extraction process. The best lake classification can be derived from the digital representation of LANDSAT. Accounting for the differences in atmospheric conditions from day to day is an important consideration in the analysis of LANDSAT imagery. A collection of computer programs has been developed to derive lake trophic status from LANDSAT imagery which correlates well with ground calibration. This analysis technique is a cost-effective method of classifying inland lakes in Wisconsin.
W79-03682

APPARATUS AND METHOD FOR SAMPLING WATER FOR FISH LARVAE AND OTHER TROPHIC LEVELS,
Lawler, Matusky and Skelly Engineers, Tappan, NY. (Assignee)
P. M. McGroddy.
U.S. Patent No 4,117,726, 7 p, 6 fig, 2 ref, Official Gazette of the United States Patent Office, Vol 975, No 1, p 63, October 3, 1978.

Descriptors: *Patents, *Sampling, *On-site investigations, *Environmental effects, Water quality, Cooling water, Aquatic life, Fish, Larvae, Electric powerplants.

Samples of fish life in the larvae and egg stage and shortly thereafter, plankton and similar marine life are obtained by a two stage fine mesh partitions apparatus. By taking samples before and after water has passed through cooling facilities of electric generating plants along a river, some of the effects of the powerplant on the environment can be determined. The outstanding feature of this invention is that it collects the samples without passing the marine life through pumps in which much of it is killed or injured. Samples are collected in partially submerged equipment into which the water flows by gravity, and the water is discharged by pumps after the samples have been removed. (Sinha-OEIS)
W79-03781

WATER COLLECTION INDICATOR DEVICE,
For primary bibliographic entry see Field 3F.
W79-03785

MAP UNIT COMPOSITION ASSESSMENT USING DRAINAGE CLASSES DEFINED BY LANDSAT DATA,
Soil Conservation Service, Lafayette, IN.
F. R. Kirschner, S. A. Kaminsky, R. A. Weismiller, H. R. Sinclair, and E. J. Hinzel.
Soil Science Society of America Journal, Vol. 42, No. 5, p 768-771, September-October 1978. 3 fig, 2 tab, 15 ref. NASA NGL-15-005-186.

Descriptors: *Soil classification, *Drainage, *Remote sensing, *Satellites(Artificial), Soils, Soil types, Soil moisture, Vegetation, Mapping, Loam, Silts, Maps, Soil science, LANDSAT.

Soil survey map units are designed such that the dominant soil represents the major proportion of the unit. At times, soil mapping delineations do not represent adequately conditions as stated in the map unit descriptions. Digital analysis of LANDSAT multispectral scanner (MSS) data provides a means of accurately delineating and quantifying soil map unit composition. Digital analysis of LANDSAT MSS data collected on 9 June 1973 was used to prepare a spectral map for a 430-ha area in Clinton County, Indiana. Sixteen spectral classes were defined, representing 12 soil and 4 vegetation classes. The 12 spectral soil classes correlated with soil drainage characteristics and were grouped into four drainage classes. The four spectral vegetation classes were grouped for convenience into one vegetation class. The soil delineation produced using these groupings were compared to a conventionally prepared soil map. Three map units were investigated in detail: (1) Mahalasville silty clay loam, poorly drained; (2) Reesville silt loam, 0 to 2% slopes, somewhat poorly drained; and (3) Xenia silt loam, 2 to 6% slopes, eroded, moderately well drained. Results indicated that soil drainage characteristics can be identified. Correlation of drainage characteristics with soil series allows for the composition of soil map units to be accurately ascertained. (Sims-ISWS)
W79-03802

GRAVIMETRIC VS. VOLUMETRIC DETERMINATION OF WATER STORAGE IN VERTICALLY UNSTABLE TILLAGE LAYERS,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
R. Steinhardt.
Soil Science Society of America Journal, Vol. 42, No. 5, p 836-837, September-October 1978. 1 tab, 14 ref.

Descriptors: *Water storage, *Soil water, *Moisture content, Analytical techniques, Irrigaton, Wetting, Drying, Water utilization, Soil compaction, Drainage, Frost heaving, Methodology, Gravimetric analysis, Volumetric analysis, Soil science.

Methods of determining water storage (W) in a tillage layer of changing height were analyzed to compare the effects of agrotechnical management on W. Changes in W may be evaluated from a single estimate of the solid mass per unit area at a state of reference and periodic observations of the

gravimetric water content of the tillage layer, which is equivalent to the usual procedure in stable soils. (Sims-ISWS)
W79-03806

MEASUREMENT OF FURROW INFILTRATON RATES MADE EASY,
Science and Education Administration, Prosser, WA. Federal Research
D. E. Miller, and W. W. Rasmussen.
Soil Science Society of America Journal, Vol. 42, No. 5, p 838-839, September-October 1978. 3 fig, 1 tab, 9 ref.

Descriptors: *Infiltration, *Irrigation, *Infiltrometers, On-site investigations, Irrigation systems, Furrow irrigation, Measurement, Flow rates, Data processing, Instrumentation, Flow control, Agriculture.

An irrigation system was developed for infiltration studies. The system utilized overflow controls to maintain nearly constant inflow into irrigation furrows. Furrow outflow was measured with HS flumes equipped with water level recorders. Data were converted easily and rapidly to infiltration rates and cumulative infiltration by a computer. (Sims-ISWS)
W79-03807

COMPARISON OF CALCULATED AND EXPERIMENTALLY DETERMINED VALUES OF SOIL-WATER DIFFUSIVITY,
Haryana Agricultural Univ., Hissar (India). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W79-03812

THE CULTURE COLLECTION POINT OF VIEW,
Culture Centre of Algae and Protozoa, Cambridge (England).
For primary bibliographic entry see Field 5A.
W79-03845

A MODIFIED TURBIDOSTATIC SYSTEM FOR ALGAL POPULATION STUDIES,
Euratom European Community, Varese (Italy).
For primary bibliographic entry see Field 5A.
W79-03847

X-RAY ANALYSIS OF AIRBORNE ASBESTOS, DESIGN AND CONSTRUCTION OF A PROTOTYPE ASBESTOS ANALYZER,
Naval Research Lab., Washington, DC. Radiation Technology Div.
For primary bibliographic entry see Field 5A.
W79-03967

PROCEEDINGS OF THE SECOND WORKSHOP ON SAMPLING GEOTHERMAL EFFLUENTS.
For primary bibliographic entry see Field 5A.
W79-03987

7C. Evaluation, Processing and Publication

LOWER SANTEE RIVER ENVIRONMENTAL QUALITY STUDY; AN ASSESSMENT OF SELECTED BIOLOGICAL AND PHYSICAL PARAMETERS.
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 5B.
W79-03513

CONTINUOUS SIMULATION OF NONPOINT POLLUTION,
Ramlit Associates, Berkeley, CA.
For primary bibliographic entry see Field 5B.
W79-03515

SIMULATION PROCEDURES FOR BOX-JENKINS MODELS,
University of Western Ontario, London.
For primary bibliographic entry see Field 2E.
W79-03523

SIMULATION OF ADVANCED WASTEWATER TREATMENT SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-03524

RECENT DEVELOPMENTS IN THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM AREA,
Army Engineer Div., Southwestern Dallas, TX.
For primary bibliographic entry see Field 4A.
W79-03526

METEOROLOGICAL ANALYSIS OF AN OAHU FLOOD,
Hawaii Univ., Honolulu. Dept. of Meteorology.
For primary bibliographic entry see Field 2E.
W79-03580

MAGNETIC SURVEY OF ICE WEDGES,
For primary bibliographic entry see Field 2C.
W79-03613

ON THE THEORY AND MODELING OF DYNAMIC PROGRAMMING WITH APPLICATIONS IN RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W79-03671

THE LANDSAT LAKE EUTROPHICATION STUDY,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 7B.
W79-03682

METHODOLOGIES OF EXAMINING POLLUTION FROM URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W79-03689

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LYNN AND GRAZA COUNTIES, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W79-03818

CONTRIBUTIONS TO THE HYDROGEOLOGY OF ALBERTA.
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2F.
W79-03819

THE HYDROGEOLOGICAL RECONNAISSANCE MAPS OF ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
J. Toth.
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 1-11, 1977. 5 fig, 33 ref.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Mapping, *Canada, Geology, Maps, Groundwater, Wells, Water wells, Data collections, Surveys, Aquifers, Water resources, Water quality, Water yield, Hydrology, *Alberta(Canada).

In 1968, a program of hydrogeological reconnaissance mapping in Alberta was started by the Alberta Research Council, with completion envisaged in approximately 11 years. The purpose of the program is to publish hydrogeological maps, graphic portrayals of the groundwater conditions and their controlling factors--for each of 47 different areas in the province. These maps will provide an overview of the hydrogeological conditions in the province, and will assist in the solution of groundwater-related problems such as water resources development, land use planning, civil engineering and environmental queries, basic and applied research, and the planning of future research projects. The maps are published at the scales of 1:125,000, 1:250,000 or 1:500,000, depending upon the amount of available data. The main items on a typical map sheet are a central main map, 4 hydrogeological cross sections, 4 to 6 side maps, a conversion table and a legend. The maps, though self-contained, are accompanied by short reports which give information on features not readily illustrated pictorially. The sources of basic data include water well drillers' reports, oil company information, geological reports, chemical analysis of water samples, field surveys, test drilling, and pump testing. The maps are produced at a rate of one map sheet per geologist per year, or a total of 2 to 4 map sheets annually. Out of the approximately 47 mapped areas of the province, 32 have been mapped to date, and maps for 15 areas have been published. The average cost of the completed maps to the Alberta Research Council is approximately $15.5 per sq mi ($6.00 sq km) of area mapped. (See also W79-03819)(Sims-ISWS)
W79-03820

APPARENT TRANSMISSIVITY AND ITS DETERMINATION BY NOMOGRAM,
Alberta Research Council, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 2F.
W79-03821

DLSPLOT: A COMPUTER PROGRAM FOR TRANSLATING DOMINION LAND SURVEY COORDINATES TO UNIVERSAL TRANSVERSE MERCATOR COMPATIBLE COORDINATES,
Alberta Research Council, Edmonton. Groundwater Div.
A. T. Lytviak.
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 65-92, 1977. 7 fig, 1 tab, 1 ref, 1 append.

Descriptors: *Mapping, *Computer programs, *Maps, Geologic mapping, Data processing, Data collections, Analytical techniques, Groundwater, Hydrography, Hydrologic data, Well data, Projections, Hydrology, Hydrogeologic mapping, Coordinate mapping, Coordinate systems, Coordinate translation, Map coordinates, Geography.

The computerization of many phases in the production of the reconnaissance hydrogeology map series has encountered difficulties inherent in mapping in a complex coordinate system. The National Topographic System, using Transverse Mercator projections, has polar coordinates. The Dominion Land Survey system is a synthesis of orthogonal and polar coordinate systems. The computer output device operates in an orthogonal system. Dominion Land Survey coordinates are used for input and National Topographic System compatible maps are desired as output, mapping by computer must invoke a suitable translation program. The construction of such a program was undertaken by simplifying the coordinate system to a minimum extent consistent with keeping the resolution errors within set limits. The scale of 1:250,000 was used as a criterion for acceptability, as this scale is most commonly used in the reconnaissance map series. Simplicity of utilization was achieved by minimizing the parameters necessary to define the area to be plotted. Three parameters were found necessary and additional ones useful. These par

eters were: horizontal field in ranges, the vertical field in townships the scale as a ratio, and two adjustment factors. (See also W79-03819)(Sims-ISWS)
W79-03826

PUBLIC GROUNDWATER SUPPLIES IN HENDERSON COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-03827

8. ENGINEERING WORKS

8B. Hydraulics

THE CIVIL ENGINEER'S RESPONSIBILITY IN IMPACT ANALYSIS.
American Society of Civil Engineers, New York. Committee on Impact Analysis of the Water Resources Planning.
For primary bibliographic entry see Field 6G.
W79-03541

8C. Hydraulic Machinery

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-03537

INFORMATION REQUIREMENTS FOR IMPROVING HYDROPOWER,
California Univ., Los Angeles. Dept. of Engineering Systems.
W. W-G. Yeh, L. Becker, and R. L. Sohn.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 104, No WR1, p 139-156, November 1978. 4 fig, 11 tab, 37 ref.

Descriptors: *Hydroelectric power, *Remote sensing, *Streamflow forecasting, *Information systems, Flood control, Decision making, Reservoirs, *Watersheds(Basins), Multiple-purpose reservoirs, Optimization, California, Sensitivity analysis, Energy loss, Runoff, Mathematical models, Systems analysis.

A method of analysis is described with the objective of determining how (and whether) aerospace-derived information system technology can effectively increase hydropower production. The increase in annual hydropower benefits is derived from more accurate reservoir inflow forecasting based upon the use of new or improved sensors and satellite data relay systems. Sensitivity analyses are presented for watershed parameters imbedded in conceptual watershed models. Results are related to hydropower production and sensor requirements via a reservoir optimization model to establish information system requirements. A numerical example is presented using a typical multiple-purpose reservoir system located in northern California. (Bell-Cornell)
W79-03542

WET/DRY COOLING SYSTEMS FOR FOSSIL-FUELED POWER PLANTS: WATER CONSERVATION AND PLUME ABATEMENT,
United Engineers and Constructors, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5G.
W79-03547

HEAT STORAGE WELLS: KEY TO LARGE-SCALE COGENERATION.
General Electric Co., Santa Barbara, CA. Center for Advanced Studies.
For primary bibliographic entry see Field 4B.
W79-03586

ANALYSIS OF DIFFERENT TYPES OF DRY-WET COOLING TOWERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
M. S. Cheng, T. E. Croley, II, and V. C. Patel.
Available from the National Technical Information Service, Springfield, VA. 22161 as PB-261 315, Price codes: A09 in paper copy, A01 in microfiche. Final Report Volume I IIHR Report No. 191, July 1976. 169p, 45 fig, 9 tab, 72 ref. OWRT C-6011(5201)(2), 14-31-0001-5201.

Descriptors: *Consumptive use, *Cooling towers, *Powerplants, *Thermal pollution, *Thermal powerplants, *Water cooling, *Water consumption, Dry cooling, Dry-wet combination, Cooling system design, Waste heat, Wet cooling.

A comprehensive computer code was developed for the assessment of the economics of various types of combination dry-wet cooling towers for steam-electric power plants. The model considered the basic thermodynamics of wet (evaporative) and dry (conductive) heat transfer, steam turbines, condensers, and the influence of different power loading patterns and changing meteorological conditions, as well as the various economic parameters. In the latter category are the capital costs associated with the equipment as well as the lost capacity at extreme meteorological conditions, and the operating costs resulting from fuel consumption, water usage, maintenance, internal power requirements, and under-production of energy. Studies were made of the thermodynamic and economic performance of several parallel and series air path dry-wet cooling tower configurations. In addition to demonstrating the general usefulness of the models, several promising configurations were identified which seem attractive in their economic, water conservation, and fog abatement aspects. In particular, it parallel air path towers are more flexible and effective than comparable series air path arrangements. The most favorable configuration is the one in which separate dry and wet units of conventional design are utilized simultaneously. Combination dry-wet cooling towers are economical in comparison with conventional wet towers when the cost of water is sufficiently high. (See also W79-03662) (Giaquinta-Iowa)
W79-03661

OPTIMUM COMBINATIONS OF COOLING ALTERNATIVES FOR STEAM-ELECTRIC POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, A. R. Giaquinta, R. M. H. Lee, and T-D. Hsu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 576, Price codes: A09 in paper copy, A01 in microfiche. IIHR Report No 212, July 1978. 166 p, 75 fig, 15 tab, 72 ref. OWRT C-6011(5201)(3). 14-31-0001-5201.

Descriptors: *Thermal powerplants, *Cooling systems, Cooling ponds, *Cooling towers, Once-through, *Economic analysis, Waste heat, Water consumption, Thermal pollution, *Alternative planning.

An overview of cooling alternatives and detailed system thermodynamics are presented. Computer models are developed and used to study the thermal characteristics, economics, and water consumption of wet tower/cooling pond and wet tower/once-through combination cooling systems. The effects of both meteorological conditions and economic parameters are examined to identify optimum cooling system configurations for several case studies. The case studies illustrate the cooling system arrangements which are attractive from both their economic or water conservation aspects. The combination cooling systems also are compared with dry/wet cooling systems. The parallel water path configuration of the wet tower/cooling pond combination cooling system is economically superior to the series water path configuration for meteorological conditions of Los Angeles, California. For the wet tower/once-through combination cooling system, a series water-path arrangement with a partially closed-cycle loop appears to be the most attractive configuration for meteorological conditions of Sioux City, Iowa. Combination wet tower/once-through cooling systems are more economical than once-through cooling associated with low river heat assimilation capacity. This report is Volume II of the Final Report to the Office of Water Research and Technology; Volume I is IIHR Report No 191 entitled: 'Analysis of Different Types of Dry-Wet Cooling Towers'. IIHR Limited Distribution Report No 58 contains the computer program listings and input data which were used to perform the calculations. (See also W79-03661)
W79-03662

METHOD AND APPARATUS FOR CONTROLLING A WATER TURBINE,
Leyrpic - Creusot Loire, Grenoble (France). (Assignee).; and Compagnie Nationale du Rhone, Lyons (France). (Assignee).
L. Megnint.
U.S. Patent No. 4,120,602, 5 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 975, No. 3, p. 1043, October 17, 1978.

Descriptors: *Patents, *Water control, *Hydraulic turbines, Bulb turbines, Sluice gates, Flow control, Guide vanes.

With a view to simplying the structure of mobile guide vane assemblies and in particular those of bulb type turbines, the invention provides a method of controlling the operation of a bulb type water turbine. The mobile guide vane assembly serve only to deflect the water during operation, the starting and stopping of the turbine being controlled and water-tight sealing when the turbine is stopped is provided by a gate sluice. Under these conditions, the guide vane assembly need not be water-tight and it comprises vanes having limited angular play which is sufficient to produce the required deflection of water during operation of the turbine. The clearance between the guide vanes and the housing plates can be greater, hence allowing a more simplified shape of the parts and machining which is not so precise. It is also possible to impart a better hydraulic shape to the vanes. Lastly, the number and the length of the vanes can be reduced, for the guide vane assembly no longer has to close the duct completely. (Sinha-OEIS)
W79-03795

ECONOMIC ANALYSIS, ROOT CONTROL, AND BACKWATER FLOW CONTROL AS RELATED TO INFILTRATION/INFLOW CONTROL,
American Public Works Association, Chicago, IL.
For primary bibliographic entry see Field 5G.
W79-03841

8D. Soil Mechanics

INVESTIGATION OF THE FEASIBILITY OF DEWATERING BURIED VALLEY SANDS TO AID SEWER-TUNNEL EXCAVATIONS, EDMONTON, ALBERTA,
Alberta Research Council, Edmonton. Groundwater Div.
G. M. Gabert.
In: Contributions to the Hydrogeology of Alberta, Bulletin 35, Alberta Research Council, Edmonton, p 41-53, 1977. 14 fig, 2 tab, 3 ref.

Descriptors: *Dewatering, *Tunnels, *Sands, Sand aquifers, Wells, Water wells, Pumping, Observation wells, Drawdown, Tunnel failure, Sewers, Structures, Geology, Aquifers, Engineering, Civil engineering, *Edmonton(Alberta), *Alberta(Canada), Drawdown curves, Sand flows

Excavation of a large-diameter sewer tunnel in the City of Edmonton was brought to a halt twice in 1973 because of the flow of saturated sand into the tunnel from the excavation front. A production well and observation wells were installed, and an aquifer test was conducted to provide basic data to calculate the feasibility of dewatering buried valley

sands overlying the tunnel. Conclusions showed: (1) that dewatering is feasible using 20 wells spaced 10 ft apart in an arrangement of two lines 30 ft apart parallel and adjacent to each side of the position of the tunnel; (2) that well completions can be inexpensive and that each well would have to be pumped at 25 igpm or higher; and (3) that at least 1 week or more of continuous pumping would be required. (See also W79-03819)(Sims-ISWS)
W79-03824

8G. Materials

PHYSICAL METHODS OF STUDYING ICE AND SNOW,
Army Terrestrial Science Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W79-03596

MECHANICAL PROPERTIES OF SNOW AS A CONSTRUCTION MATERIAL,
A. F. Vuori.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 155-162, August 1976. 3 fig, 1 tab, 14 ref.

Descriptors: *Snow, *Mechanical properties, *Construction materials, *Cold weather construction, Foundations, Roads, Road construction, Runways, Construction, Cold regions, Loads(Forces), Deformation, Stress, Density, Strength, Strength of materials, Rheology.

Various snow processing methods can be used to transform snow into a useful construction material in polar regions, where use of conventional construction materials is uneconomical or impossible. This transformation is associated with significant change in mechanical properties of snow. This work was devoted to the results of research on this change. The problems of using compacted snow to build roads, runways, and foundations for various structures were examined. (See also W79-03596)(Sims-ISWS)
W79-03624

METHODS FOR MEASURING THE STRENGTH CHARACTERISTICS OF NATURAL AND PROCESSED SNOW,
G. Abel'.
In: Physical Methods of Studying Ice and Snow, Draft Translation 539, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, p 174-184, August 1976. 3 fig, 3 tab, 14 ref.

Descriptors: *Snow, *Mechanical properties, *Strength, *Measurement, Methodology, Construction materials, Strength of materials, Equipment, Instrumentation, Loads(Forces), Deformation, Stress, Density, Construction, Cold regions, Cold weather construction, Foundations, Roads, Runways, Rheology, Natural snow, Processed snow.

A review of snow strength characteristic tests was presented. Recommendations for using the most convenient methods and instruments in the field were given on the basis of a comparative analysis. The author has developed a classification of methods based on the 'desirability of use' of a particular testing method. (See also W79-03596)(Sims-ISWS)
W79-03627

FIELD ANALYSES OF PHYSIOCOMECHANICAL PROPERTIES OF ICE COVER,
For primary bibliographic entry see Field 2C.
W79-03631

8I. Fisheries Engineering

BIOLOGICAL PROBLEMS WITH THE USE OF SEA WATER FOR COOLING,
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- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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